COMPUTER SOFTWARE

Def1: Intangible components of a computer system.

DEF 2: These are the electronic instructions, commands or programs which tells the computer how to perform tasks.

Alternatively, a program is a complete sequence of instructions for data processing to be performed by a computer.

Types/ categories Software

- Application software
- System software.

USER INTERFACES

Def: User Interface is the way in which the computer presents itself to the user and the way the user will communicate or interact with the computer in terms of giving commands. It also determines how easily you will open a program. A good interface should have the following characteristics:

- It should be user friendly.
- It should be attractive so that it encourages the user to use it.
- Effective and easy to use.

There are two types of User Interfaces

- Command Line Interface (CLI)
- Graphical User Interface (GUI)

COMMAND LINE INTERFACE (CLI)

Def: This is the type of interface in which the user uses the keyboard to enter key words or to press special keys in order to give instructions to the computer. Spelling and syntax need to be remembered and entered accurately.

Advantages of CLI

- Very fast in executing commands
- Takes up little memory hence does not need a faster processor
Repetitive tasks can be automated by grouping commands

Disadvantage

• Not user friendly since we have to memorize commands

GRAPHICAL USER INTERFACE (GUI)

Def: This is the interface which menus and visual images like icons, buttons, lists to issue commands to the computer. The control or communication is done by pointing the mouse and clicking on the appropriate icons.

Advantages of GUI

• User friendly since it is easy to learn and use
• No need of memorizing commands
• Almost all applications have the same appearance

Disadvantages

• Heavy and occupies a lot of disk space
• Require more memory and a faster processor
• Easily affected by computer viruses
• It is difficult to automate functions for expert users

SYSTEM SOFTWARE

Def: These are programs which contribute to the control and performance of the computer system and its devices.

Def: Programs used by the computer to execute its tasks

They enable application software to interact well with the computer, and also help it in managing its internal and external resources

TYPES OF SYSTEM SOFTWARE

1. Operating system
2. Utility programs / system utilities
3. Programming Languages

1) OPERATING SYSTEMS
An operating system is a master control program which manages and supports the operations of the computer system. Operating systems contribute to the control and management of the computer system.

E.g. Window 98, NT, 2000 & XP, UNIX, Linux, Wang, Novel Netware, Macintosh etc

**Popular operating systems for microcomputers include:**

1. DOS
2. Windows o/s e.g XP Windows Vista, Windows 7, Windows 8
3. Mac OS
4. OS/2 Wrap
5. NetWare
6. UNIX
7. Linux
8. Solaris
9. Palm OS

**Operating systems can be classified as:**

i. **Single user OS e.g. DOS.** Allows only one user to run one program at a time
ii. **Multi-user OS** e.g. UNIX, LINUX, Windows etc. Enables one or more users to run a program multiple users at once or different times
iii. **Multi–tasking OS** e.g. Windows, Linux, O/S2 Allows one user to work on two or more applications that reside in the memory at the same time
iv. **Multi–processing OS** e.g. Linux, UNIX windows2000 Can support two or more CPU’s running programs at the same time. An operating system capable of supporting and utilizing more than one computer processor
Functions of the Operating System

- Provides an interface between the user and the computer
- Manages the flow of information in the computer
- Keeps record of the saved files, their names, sizes, location etc.
- It establishes relationships between hardware and software
- It controls the running of other programs
- Controlling the use of peripherals.
- Organizing the use of memory/Memory management
- It helps in the booting process of a computer.
- It helps in file management

(a) PROGRAMMING LANGUAGES

- A language is a media of communication between human beings or computer
- A program is a logically arranged set or list of instructions that direct a computer on what to do.
- Programming is a multi–steps process for creating computer instructions. Instructions consist of coded statements used in a programming language like Basic, COBOL, etc.
- Programming Language are software programs used by programmers to write computer software instructions.
- A programmer is a person who uses a programming language to write computer software instructions

What is a program: A program is a set or a list of instructions that a computer must follow in order to process data into information. Instructions consist of coded statements used in a programming language like Basic, COBOL, etc.

Programming languages can be;

- General programming languages or,

- Web development languages e.g. HTML, JAVA, etc. for instance we can apply HTML to design one of the web pages for Namilyango college website as follows;

    <HTML>
    <HEAD>
    <TITLE> Namilyango college SITE</TITLE>
    </HEAD>
Welcome to the centre for business adventure.

Programming Tools Include:

(1) **Debuggers**: Programs which help programmers, to detect, locate or remove routine, syntax (process) and logical errors.

**Debugging** is rectifying an error in a computer program

A **bug** being an error in a computer program

(2) **Linkers**: Enable calculation of any functions in the program.

(3) **Editors**: Facilitate creation, editing and formatting of program text files.

Categories of Programming languages:

Programming Languages are categorized by their level and purpose. They are normally categorized into groups reflecting the historical development of computer languages they include:

- Low level languages (Machine code and Assembly Language)
- High level languages e.g **COBOL, Basic, Pascal and FORTRAN**
- Fourth Generation languages (4GLs)
- Fifth Generation Languages (5GLs)

**Low level languages**

1. **(a) Machine language/codes** (First Generation Language): These languages provide basic computer languages representing memory location, instructions and data in binary digits of 1s and 0s

   Computers do not understand any languages apart from the machine code

**Characteristics machine codes**
Can be used directly by the computer without interpretation.

They are machine/computer depend.

Not user friendly - Not very easy to learn, write, correct.

(b) **Assembly Language (2nd Generation languages -1950)**

Are low level languages (LLL) that allow the programmer to use abbreviations or easily remembered words instead of binary codes. E.g. Mult = Multiply; STO = Store, Div = Divide, add= addition etc.

2) **High level languages (HLL)**

(a) **3rd Generation languages**, Examples of high generation languages include **COBOL, Basic, Pascal and FORTRAN**.

(b) **4th Generation languages (early 1970s)**

These are Very High-level non-procedural languages or rapid application development tools where programs are written by only telling the computer what to do as opposed to a step-by-step process.

Examples include, SQL (structured query language), C++, etc

(c) **5th Generation language**: - Natural languages

These are programming languages which allow questions or commands to be formed in a more conversational way or in alternative forms.

3. **LANGUAGE TRANSLATORS**: 

These are programming tools which change programs written in 2nd, 3rd, 4th, and 5th generation languages into machine codes or 1st generation language (Os and 1s) which the computer can understand. Language translators are of three types, i.e.

-Assemblers

-Compilers,

-Interpreters

(a) **Assembler**: -

Is a program that translates the assembly – language program into machine language

(b) **Compiler**: (Executes later)
Is a language translator that converts the entire program of a high-level language into machine language before the computer executes the program.

(c) Interpreters

Is a language translator that converts each high-level language statement into machine language and executes immediately, statement by statement.

(c) UTILITY PROGRAMMES

These are programs developed to improve, configure, analyze, optimize and maintain a computer in its working operations.

Specific Utilities and their Functions

3) Back-up utilities: Help in making duplicate copies of every file on either internal or external media as security files for reference incase the original copy is destroyed.
4) File compression utility: Reduces the size of the file. It helps to increase the disk space. E.g. Winzip
5) File viewer utility (file manager): It displays and copies the contents of a file, deletes, renames, moves and copies files
6) Uninstaller utility: It removes applications and associated entries in the system files
7) Diagnostics utility: Compiles technical information about the computers’ hard ware and some system software programs and then prepares a report outlining any identified problems
8) Data Recovery utility: Used to “undelete” or resurrect a file or information that has been accidentally deleted e.g. Recycle bin for windows, Norton un-erase wizard, etc.
9) Defragmentation utility or “Defragger” Used to find all scattered portions of files on the hard disk and reorganize them as contiguous files.
10) Disk Repair Utility: Checks your disk drive for defects and make repair on the spot or mark the bad area.
11) Virus Protection Utilities/Anti-virus software: Is a utility program that scans storage media (hard disks, diskette and memory) to detect and destroy virus. E.g. MacAfee virus scan, web scan, Norton antivirus, Dr. Solomon’s anti-virus toolkit, etc
12) Data Processing Utilities: Utility programs which remove redundant elements, gaps, and unnecessary data from computer storage space.
13) Memory management utilities: These are programs that determine how to efficiently control and allocate memory resources – (usually activated by software drivers)
14) Screen saver: It makes the monitor’s screen to display moving images, patterns or blank screen when the computer is not in use for some time. Screen users are primary used for protecting the screen. They are also meant for security advertisement
15) Sort utility: Used for taking in data and re-arranging it in any prescribed order
16) Merging utility: Involves combining data from more than one file into one
Software is available in a variety of forms:

- **Packaged software**: is commercial software, which is copyrighted and designed to meet the needs of a wide variety of users.
- **Software suite**: a software suite is a collection of individual application software packages sold as a single package. A software suite usually includes *Microsoft office*: a word processor, spreadsheet software, database software, and presentation software.
- **Custom software**: is a tailor-made software, which is developed at a user's request to
- **Freeware**: is copyrighted software provided at no cost to users.
- **Shareware**: is copyrighted software that is distributed free for a trial period, and payment is required for using the software beyond that trial period.
- **Public-domain software** is free software donated for public use and has no copyright restrictions.
- **A software update** provides bug fixes and minor software improvements and is made available by free download. Software updates sometimes include new drivers to support the latest hardware such as printers, CD drives and DVD drives. A software update is sometimes called a software patch because it is applied over software that you already have installed. A software update does not provide a full software package installation.
- **A software upgrade** is a purchase of a newer version of software you currently use of a more fully-featured version of your current software.

*Software related terms.*

a) **Version**: A version is a major upgrade in a software product e.g. from Pas 5.0 to Pas 6.0.

b) **Release**: Is a minor upgrade in a software product e.g. Pas 5.0 to Pas 5.2.

c) **Compatibility**. Means that documents created in earlier versions can be successfully processed on later versions.

**COMPUTER VIRUSES**

i) **VIRUSES**: A computer virus is a defiant program that attaches its self to the computer system and destroys or corrupts data.

Viruses are developed through love for *Adventure, Malice and sabotage, personal economic gains*,

**Ways through which viruses are spread;**

(a) Through using infected diskettes from infected computer systems and sales demonstration applications

(b) Starting the computer with infected floppy disks in the drives

(c) Opening electronic mail messages or attachments which have been infected, e.g. Bulletins, Free computer games on the net

(d) Down-loading infected software from the Internet.

(e) Software updates and Copying illegal software
Protecting the Computer System Against viruses

- Buy software from Authentic/ legal vendors
- Avoid running unchecked/ scanned files
- Avoid running files with attachment from unknown sources on the network.
- “Back-up your file plus folder regularly”
- Use Netware with strong validation checks and in-built firewalls (e.g. Linux). i.e. Hardware and software which can limit unauthorized data through Networks to reach your workstation.
- Disable Auto micros functions for Macro viruses.
- Write protect the recovery disk before using it
- Do not start the computer with disks like floppy disk in their disk drives

- Use anti-virus programs. Utility programs used to scan files and programs in order to detect, destroy or quarantine virus-infected files e.g.
  - Mcafee
  - AVG
  - kaspersky
  - Norton
  - Web scan
  - Avira
  - DR. Solomon’s Anti virus Toolkit,

Virus Symptoms

- Annoying messages e.g. Your Pc is stormed, not secure or infected.
- Adding garbage to files
- Computer switching its self off and on
- Less memory available than usual
- Programs taking longer to load
- Access lights turning on for non referred devices
- Unnecessary variations in computer processing speeds
- Deletion of saved file or obliteration of the functioning of the Computer system or software
- Boot failure.
- Unprecedented screen colour changes.
- Hard disk crash
- Reformatting of the hard disk which is typical of

  World concept virus

  - Wazuzu
  - Hurri
  - Boot Malmo
Types of Viruses

Viruses are classified as follows:

- File viruses
- Boot viruses
- Micro Viruses
- Network viruses

(a) **Boot Sector viruses (BSU).** These are viruses which attack and reside in programs containing instructions for booting or powering up the computer system e.g. Anti-CMOS virus, Anti-EXE, New York Boot (NYB), Stoned, Empire, Monkey, Ripper etc

(b) **File viruses.** These are viruses which attach themselves to files which begin/load a program (i.e. executable files). In DOS, files with extensions like .EXE or .COM.

(c) **Multipartite virus.** Combine traits of both file and boot viruses e.g. Junkie virus and Parity boot viruses. Polymorphic virus can mutate or change form, whereas Stealth virus can temporally remove self from memory

(d) **Macro viruses.** These are procedural or syntax viruses. They are found inside common data files such as those created by E-mails, Spread sheets, word. E.g. Concept viruses in word documents, Laroux in excel.

(e) **Time bomb.** Virus which activates on a set date or time

(f) **Logic bomb.** It activates when it detects a certain condition

(g) **Trojan horse.** Viruses which place illegal and destructive instructions in the middle of the legitimate program or file. Once the program is run, the Trojan horse is also activated to begin havoc. E.g. Format C Virus

(h) **Worm.** Copies itself repeatedly in memory or on a disk drive until no memory or disk space is left. This makes the computer to stop working

**APPLICATION SOFTWARE**

These are programs that are developed to meet the needs of the end users
Application software is subdivided into:

- Custom or tailor made software
- Packaged/off shelf software
- Freeware
- Shareware
- Public domain software

(A) CUSTOMISED (specialized or tailored) Software

These computer programs which are designed and developed for individual customer specified needs

Examples of custom-made software include

- Banking system software
- Payroll system software
- School management systems
- Insurance systems
- Utility (electricity, water etc) billing systems
- Airline reservation systems

Advantages custom/bespoke software

- Hard to manipulate
- Meets all the specific user needs
- Can be modified by the users themselves
- Improve image of the organization.
- Increases productivity

Disadvantages

- They are very expensive to design and develop.
- No online updates
- Single user may not easily identify all the weaknesses
- Cannot be installed immediately and they require user training and software documentation
- They are time consuming to develop.
- They need a lot of specialized skills which require expensive special training.

(B) OFFSHELF (packaged) software

These are commercial software programs which copyrighted and developed to meet the general needs of a variety of end users.
In this type of software we have different sub types such as,

1. **Word processing software**: also known as a **word processor** is used to create, edit, format, save, and print documents that contain text and graphics. For example, **Ms word**.

2. **Spreadsheet software**: is used to organize data in rows and columns, and perform calculations on the data. For example, **Ms. Excel**.

3. **Database software**: is a collection of data organized in a way that Spreadsheet software: is used to organize data in rows and columns, and perform calculations on the data. For example, **Ms. Access**.

4. **Presentation software**: is used to create presentations, which can communicate ideas and other information to a group of audience. For example, **Ms. PowerPoint**.

5. **Desktop publishing software**: is used to design and produce complicated documents that contain text, graphics, and brilliant colors. For example, **Ms. Publisher**.

**Advantages of off shelf software**

- They are cheap as the development costs are spread over the many customers
- The many users can easily inform the software developer about the success or failure of the software
  - Any problem with the software can easily be identified and rectified
- The software can be bought and used immediately since the programs are already documented
  - Updates can easily be obtained online
  - The programs have less error

**Disadvantages of off shelf software**

- They may not meet all the needs of the users
- The buyer may not legally be allowed to modify the software

**Characteristics of good computer software**

*What the software consumer wants*

- Cheap to buy
- Easy to learn
- Easy to use
- Solves the problem
- Reliable
- Powerful
- Fast
Factors to consider before obtaining a software program

• Correctness — does the software do what it is suppose 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?
• Reusability — can parts of the software be easily reused to build other software systems?
• Interoperability — does the software interface with other software systems?
• Efficiency — does the software make good use of its resources (memory, disk, CPU, network)?
• Portability — can the software to easily ported (moved) to other operating
• Security — does the software protect the information it is responsible for?