INTRODUCTION TO ICT

What is Computer Literacy?

Computer Literacy: Means an understanding of what a computer is and how it can be used as a resource.

- Means knowledge and understanding of computers and their uses
- To use a computer, a user must be computer literate.

Note: Computer literate is a person having sufficient knowledge and skill to be able to use computers

Computer literacy can be explained through the following three-part definition

1. **Awareness:** becoming aware of potential of computers in our society
2. **Knowledge:** know how computer work and their function
3. **Interaction:** become comfortable in sitting before computer and use it for some suitable purpose

How to get Information from the computer?

The following principle is used **IPO** (Input- Process -Output)

1. Data is input into the computer through input devices

2. Computer process the data as per instructions

3. Computer gives out information

What is Data?

Data is a collection of raw facts, figures and statistics related to an object. Data can be processed to create useful information.

What is information?

Information is the processed data. It has meaning than data. It is used for decision making.

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When these data are processed it gives information as the Meaningful product as shown the following table

Examples of Data and Information

DATA

Johnson, 55, Salome, Mary,34, Sabrina, 5,20,178,100,189,151.

PROCESS

INFORMATION

Name	Age	Height
Johnson	4	20
Salome	34	178
Sabrina	20	189
Sabrina	51	100

Example of Information

Data collected from census is used to generate different type of information. The gover can use it to determine the literacy rate in the country. Government can use the informat important decision to improve literacy rate.

Differences between data and information

Data	Information
Is the collection of facts, figures and statistics related to an object	Is a processed data
Is not used in decision making	Used in Decision Making
Data has no meaning	Inf

Characteristics of Good Information

- **Accurate:** Information should be free from bias. Nothing should be omitted that is necessary nor should anything be included that would cause information to be misleading.

- **Complete**: All the information required for decision making should be availed.

- **Cost benefit:** Information must have some value otherwise it will not be worth the cost of collecting and processing it.

- **Understandable by the user/Clear**: Information should be clear to the user, coz if the user does not understand the information it means he can't use it properly. Explanations and interpretations should be included where necessary.

- **Relevant:** There must be a close logical relationship between the information provided and the purpose for which it is needed.

- **Adaptable in terms of communication/Right channel**: The channel of communication is also an important aspect to consider. Some information is best communicated informally by telephone or verbally whereas other information ought to be communicated formally by use of say Newsletters (when advertising), letters (applying for a job).

- **Timely:** Information should be availed to the people who need to use it at the most appropriate time and not after decisions have been taken.

- Easy to use

Terminologies continued certificate

Communication: The transmitting of a message from one point to another or a sender to a receiver through several (physical or electronic) media.

Technology: The advanced scientific knowledge that eases work. However with ICT we concentrate on that technology that handles information as well as aiding information.

ICT: This stands for Information and Communications Technology. The advanced scientific knowledge that helps to create, capture, input, process/manipulate, store, output and disseminate information for decision making.

ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. For example, personal computers, email, robots.

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ICT can simply be defined as the study or business of developing and using technology to process information and aid communication.

IT: Information Technology can be defined as a science, which **supports activities involving the creation, storage, manipulation and communication of information together with their related methods, management and applications.** Therefore, it is the broadly based technology needed to support information systems.

OR

Information technology comprises the knowledge, skills and understanding needed to employ information and communications technologies appropriately, securely and fruitfully in learning, employment and everyday life. IT is to ICT as literacy is to books.

IS: It is the interrelation among hardware, software, live ware (people), and telecommunication devices to capture, input, process, store, and output and disseminate information for decision making.

Note: Rather than IT, ICT shows the importance of communication integrated with computers. We are therefore able to see advancements like online education, online shopping, Chat rooms, E-mail, Video conferencing, International calls on computers, the use of TV cards, mobile phones integrated with radios, Newsletter websites on the internet etc.

Forms of Data or Information

- Object/Image/Video/Graphics
- Voice/Sound
- Text/words
- Numbers
- Signs and symbols

Data Presentation

Data I s usually presented in the form that the computer understands and provides easy conversation. For information to be used by the computer, it must be reduced into Bits which stands for Binary digits. A bit is a binary digit representing either 0 or 1. A string of eight Bits is called a byte which represents a character e.g. the computer representation of the word "COMPUTER" is a series of 8 bytes whereby each byte represents one character or letter in the name.

Most computers are **digital**, meaning they understand only two discrete states: on and off. These states are represented using two digits, 0 (*off*) and 1 (*on*). Each on or off value is called a **bit** (short for **bi**nary digi**t**), the smallest unit of data a computer can handle. Eight bits grouped together as a unit form a **byte**. A byte provides enough different combinations of 0s and 1s to represent 256 individual characters including numbers, letters of the alphabet, punctuation marks, and other characters.

The combinations of 0s and 1s used to represent data are defined by patterns called coding schemes. Popular coding schemes are **ASCII** (American Standard Code for Information

Interchange), EBCDIC, and **Unicode**. Coding schemes make it possible for humans to interact with a digital computer that recognizes only bits. Every character you type on a keyboard is converted into a corresponding byte, a series of on/off electrical states the computer can process.

The units used to measure computer storage capacity are;

1 binary digit (0 or 1)	1 bit
8 bits	1 byte
1 kilobyte (KB)	1,000 bytes
1 megabyte (MB)	1,000,000 bytes
1 gigabyte (GB)	1,000,000,000 bytes
1 terabyte (TB)	1,000,000,000,000 bytes
1 Petabyte (PB)	1,000,000,000,000,000 bytes
1 Exabyte	1,000,000,000,000,000,000 bytes

ICT Trends

This looks at the various changes that have taken place in the field of information and communication technology.

ICT trends have tremendously changed over the years with each year seeing new trends in the software, hardware and telecommunication network components;

Usage, the usage of ICT has significantly increased from the traditional simple computations to complex ones. It is also used to enable commerce (E-Commerce) and even entertainment owing to the fact that has become more affordable over the years.

Storage capacity, storage capacity has immensely increased. To-date computers have a capacity of over 320Gbs. Other secondary storage devices have evolved and others are having been introduced e.g. Memory sticks (Flash disk) with capacity of over 8Gb, IPods, MP3, MP4 etc

Shape and size, computers have evolved from the mainframe computers that initially occupied a lot of physical space (a whole room) to mini computers to now the micro-computers that occupy very little space, e.g. desktops, laptops, palmtops.

Portability, due to the reduction in size of computers, they have become portable. Users are able to even move with their devices e.g. laptops and mobile phones.

Processor power, with new changes in Technology, processor power has drastically increased. Processor power has evolved from 80286 (286), 80386, 80486, Pentium 1(80586), Pentium II or Pentium Pro, Pentium III, Pentium IV, Celeron, duo core to i1, i3 i5, i7, etc.

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Networks, with continuous evolution of ICT, the trend has moved from stand alone computers to networked computers to inter-networked computers. Organizations in the prior times used stand alone computers, which did not permit sharing of resources. Computers were later networked within organizations (Intranets) to facilitate communication and sharing of resources internally. These network types include Local Area Networks (LAN), Wide Area Networks (WAN), Metropolitan Area Networks (MAN), and now WLAN (Wireless LAN) etc. Presently, the Internet has taken over by a storm to enable a global connectivity of computers.

Operating systems, the operating systems have also evolved from DOS (Disc Operating System) to Windows 7. These trends have led to faster performance and ease of computer usage.

Robotics (intelligent computers) have been developed and programmed to perform certain tasks. The machines have been programmed with artificial intelligence that enables them perform mainly routine work.

Tele/video conferencing, with the advancement in ICT, videoconferencing and teleconferencing have been achieved. Different individuals and organizations are able to communicate while seeing each other using this technology without physical presence.

Blue tooth; one popular data/information exchange on the current scene is by Bluetooth. Information can be passed on from one computer or cell phone using Bluetooth technology.

Working with multimedia, Multimedia is defined as the technology that facilitates the integration of two or more types of media, such as text, graphics, sound voice, full motion video, still video or animation, into a computer based application. In recent years the media capabilities of typical computer systems have increased to the point where somebody with the appropriate skills can produce professional quality images, audio and video using commonly available hardware and software. Digital media became more accessible when Apple began to provide iMovie, iTunes, iPhoto and related applications.

Generally, although the performance of computers has greatly improved while the size has reduced, the cost of acquiring computer components has greatly decreased.

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DATA PROCESSING

Data are raw facts that can be processed to create meaningful information/usable information.

Data can be stored, transmitted or presented in a variety of forms and formats including numbers, words, pictures, sounds etc.

Data can also be defined as objective measurements of the attributes or characteristics of entities such as people, places, things and events.

Data processing is the process that involves transformation of data into information. This is done through classifying, merging, recording, retrieving, transmitting, or reporting. Turning data into information involves several steps. These steps are known as data processing.

It's the collection and manipulation of items of data/facts to produce meaningful information. It can range from a simple report with lots of routine operations to complex reports required by top management to make strategic decisions.

Data versus Information

- Data constitute building blocks of information
- Information is produced by processing data
- Information reveals meaning of data
- Good, timely, relevant information is key to decision making
- Good decision-making key to organizational survival

Importance of information to businesses

- **Planning.** To plan properly, a business needs to know what resources it has for example Cash, people, machinery and equipment, property, customers. It also needs information about markets in which it operates and the actions of competitors. At the planning stage, information becomes very important

- **Proper management of business.** Information has to be recorded so that the business can be properly managed. For example, records of employees in an organization can enable the organization to budget for the employees' salaries. As a Human Resource Manager u need to know

- **Controlling.** Once a business has produced its plans, it needs to monitor progress against the plan and control resources to do so. So information is needed to help identify whether things are going better or worse than expected and to spot ways in which corrective action can be taken.

- **Measuring.** Performance of the business must be measured for a business to be successful. Information is used as the main way of measuring performance, e.g. this can be done by collecting and analysing information as sales, costs, profits etc.

- Decision making. Information is used for decision making
- Research purposes
- Comparison purposes
- Forecasting.

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Data management

- **Data Management** is a broad field of study, but essentially is the proce managing data as a resource that is valuable to an organization or business
- Data management can also be the development and execution of architecture policies, practices and procedures in order to manage the information lifecy needs of an enterprise in an effective manner.

Motivation/Importance of Data Mgt

- Data management plays a significant role in an organization's ability generate revenue, control costs
- Successfully being able to share, store, protect and retrieve the ever-increasing amount of data can be the competitive advantage for organizations today.
- Data management helps organizations to mitigate risks.
- It enables decision making in organizations

What Are the Benefits of Good Data Management?

- Optimum data quality
- Improved user confidence
- Efficient and timely access to data
- Improves decision making in an organization

What Are the Costs of Poor Data Management?

- Misinterpretation of the data
- Lost data
- Inaccessible data
- Wasted time and money
- Missed deadlines
- Lost user confidence

The stages of Data Processing/Data Processing Cycle.

Irrespective of the methods or combination of methods used, data usually passes through the same basic stages in the processing cycles. These will include the following: -

Origination of data: This looks at the sources of data for example customer orders, goods received notes, price lists etc.

Input of data: This is the act of passing the data to the processor in the processing stage This could be by the clerk, on the computer through the keyboard etc.

There are three stages involved when inputting data i.e.

- Collection: collects the data and assembles it
- Verification: checks whether the data being processed is exact and complete

- **Coding:** translating data in order for it to be used into machine readable form by the computer.

Processing: includes all the necessary operations to arrive at the end product (information) and to keep data up-to-date.

Under processing the following activities may take place;

i) Classification: the data is classified into different groups and subgroups, so that each group or sub-group of data can be handled separately.

ii) Sorting: the data is arranged into an order so that it can be accessed very quickly as and when required.

iii) Calculations: The arithmetic operations are performed on the numeric data to get the required results. For example, total marks of each student are calculated.

iv) Summarizing: the data is processed to represent it in a summarized form. . For example, the summary of the data of student is prepared to show the percentage of those who passed and failed the examination etc.

Output: This is when data that has been processed is presented as a document. This is the production of the end product for example annual reports, financial statements, payrolls etc.

Methods of Data Processing

- Manual data processing
- Mechanical data processing
- Electronic data processing

Manual Data Processing

This method is done by individuals using simple tools such as pens, markers, rulers, erasers and people's mental capacity for the data to be processed.

Advantages

- It's cheap
- Flexible
- Easy to adopt
- Simple to use

Disadvantages

- Only low volumes suitable for each worker
- No automation of calculation or totaling potentially leading to more errors
- More personnel required for most tasks
- It takes longer time than an electronic document
- It's tiresome as it involves a lot of mental thinking
- More prone to errors
- It is slow for a large volume of data to be processed as it cannot compute a thous
  instructions in a second as compared to a computer.

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Mechanical Method

This method involves the use of machines like the traditional typewriter, duplic machines etc. it is semi manual and semi electronic.

Advantages

- It is faster than the manual method
- Quality of output is much better than the manual method
- More accurate compared to manual

Disadvantages

- The method has the weakness of machine breakdowns that may disrupt the proce
- It is more expensive than the manual method
- It's slower than electronic data processing
- Not suitable for processing large volumes of data

Electronic Method

This involves the use of automated machines like computers to process data.

Advantages

- **Speed**; It operates the speed of electric flow which is measured in billions trillions of a second. It is faster than any other machine designed to do similar wo
- **Accuracy**; High accuracy results. The electronic circuitry of a computer is such when the machines are programmed correctly and when incoming data is error the accuracy of the output is relatively assured.
- **Automatic Operation**; An electronic computer can carry out sequence of many processing operations without human interaction, the various operations are exe by way of a stored computer program.
- **Decision Making Capability**; A computer can perform certain decision instruc automatically.
- **Compact Storage**; Electronic data processing systems have the ability to store amounts of data in compact and easily retrievable form
- **Flexibility**; The modern digital computers can be used for a variety of purposes online processing, multiprogramming etc.
- **Reduction in Paper Work**; The use of computers for data processing has helpe management of business organizations to cope with increasing problem of handling. The computers have speeded up the process and have eliminated the needs through the storage of data in data bases and files.
- **Reduced Costs**; Though the initial investment for installing a computer is high, substantially reduces the cost of each of its transaction. Cost reduction occurs d processing of huge data and record keeping.
- Quality
- Handles large volumes of data
- Few errors
- More timely information can be produced

Disadvantages

- Power failure computer

- Danger of computer fraud if proper level of control and security whether internal and external are not properly been instituted.
- It's expensive to acquire
- Requires high skills to operate.
- System failure
- Fraud
- Viruses
- Expensive to acquire
- Subject to constant changes

Data Processing Modes/Strategies

Data processing involves the collection and processing of the organization's data.

Data processing modes describe the way these transactions are handled during processing. They

include: Batch processing, on-line processing, Time sharing processing, Real time processing and Distributed processing.

Batch Processing

This involves processing a group of a number of transactions of a similar kind which have been entered over a period of time in a computer system.

Example1: The way credit card companies process billing for their customers. The customer does not receive a bill for each separate credit card purchase but one monthly bill for all of that month's purchases. The bill is created through batch processing, where all of the data are collected and held until the bill is processed as a batch at the end of the billing cycle.

Example 2: a payroll for salaried workers/staff is done in one operation once a month. To help with organizing the work, the payroll office may deal with each department separately, and do the salaries for department 1, followed by the salaries for department 2 and then department 3, ands so on. If this is the case, then the batch processing would be carried out by dividing the transaction records into smaller batches e.g. one batch per department, one batch per bank etc.

Transactions will be collected over a period of time, perhaps in a transaction file, and will then be dealt with all at the same time. Some delay in processing the transactions must therefore be acceptable i.e. in a payroll system, employees must agree to regular weekly or monthly payment.

Batch input allows for good control over the input data, because data can be grouped into numbered batches. The batches are dispersed for processing and printed out list of the processed transactions is usually organized in batch order.

If records go missing, for example get lost in transit, it is possible to locate the batch in which the missing record should belong. Errors in transactions records can be located more quickly by identifying its batch number. A check can be made to ensure that every batch of data sent

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off for processing is eventually received back from processing, so that entire batc records do not go missing

Bulk volume processing in batch mode allows the processing to be divided into se stages, where each stage of processing is performed by a separate computer program.

Advantages:

- Relatively easy to develop
- Less processing power is required as it deals with similar updates.
- Less hardware required therefore cheaper.
- It allows sharing of computer resources among many users and programs,
- It shifts the time of job processing to when the computing resources are less bus
- It avoids idling the computing resources with minute-by-minute manual interv and supervision. Jobs can run without any end user interaction or are scheduled as resources permit.
- It can go unmonitored and only stops when it encounters an error or comple tasks in the script.
- It stores up tasks and executes them while the computer is idle. This spe productivity and frees memory for more exhaustive programs as well as time sa
- It optimizes a computer's performance as it takes full advantage of the proc capabilities.
- It eliminates redundant tasks such as repeating the same step over and over agai

Disadvantages

- Time lag between origination of the transactions and the information availabilit
- Late information is not suitable in situations where instant decisions are require
- Management information is often incomplete due to missing data.
- Often master files are kept off line therefore access may not always be availabl
- Undesired commands may be executed without the users knowledge
- Batch files created are not easy for a novice user to edit, so changing settings r the user to repeat the batch each time.
- The master file is not always kept up-to-date.

Real-time Processing

Is the continual receiving and rapid processing of data so as to be able to feed back the of that input to the source of the data.

Real time processing uses on-line computer system to integrate or update files as re rather than batching which puts such requests together for subsequent processing.

Transactions for processing may arise infrequently, and so it would take long to buil batch processing at the same time. Instead each transaction would be processed indi as it arises.

Alternatively, the information user might want to process a transaction immedia would not be prepared to accept the delay in batch processing

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Each transaction is processed immediately on input (rather than in batches) all the batch processing stages of input, validation of data, updating and output are applied to that one transaction by a single computer program.

Real time systems are practically the norm in modern business. Examples include

- A sale is made in a department store or supermarket and details are keyed in on the point of sale terminal, the stock records are updated in real time. Any customer wishing to buy a product can be informed as to whether the item is available or not (if not, an alternative might be offered). Although the stock files are maintained in real time, other files (for example sales analysis or debtors) may be batch processed at a later stage with the accumulated sales details (for example stored on magnetic tape) from each point of sale terminal.
- In banking and credit card systems customer details are maintained in a real time environment. There can be immediate access to customer balances, credit position etc and authorization for withdraws (or use of credit card).
- Travel agents, airlines and theatre ticket agencies all have to use real-time systems. Once a hotel room, plane seat or theatre seat is booked up everybody on the system must know about it immediately so that they do not sell the same holiday or seat to two or more different customers.

Advantages

- Information is more up to date therefore providing better information for management.
- Information is readily available for instant decision making
- Provides better services to users or customers in terms of quick service.
- It's a fast and reliable mode of data processing

Disadvantages

- Costly, as the system becomes more complex to run and to develop because in certain circumstances they are run on a 24hr basis.
- Not easy to use, user has to be trained.
- Usually use two or more computers; sharing up the workload, the concept described as multi-processing which is expensive.

On-line Processing:

This is a processing mode where all the computer peripherals and other equipments are under control of the central processor. Here the data source itself can be linked directly to the computer. It includes all actions that need to be done without delay. When one has an online system, the computer devices must be directly connected by wire, cable or telephone line to the computer system at the same time. This type of strategy can be used when getting a stock market quotation, finding the correct level of product inventory, searching a criminal's data etc.

Advantages of on-line processing

- The files are maintained up-to-date.
- Information is readily available for current decisions. This information is fed back to the work stations where they are needed.

Disadvantages of on-line processing

- These systems are complex to develop
- They are costly in terms of hardware, software, storage media, operating system communication facilities etc.

Time Sharing Process:

In this processing mode the central processor serves two or more users with different processing tasks or requirements. The central processor is therefore available to a variety of users, connected to the central computer via communication links, who may wish to process their data and receive information or test their programs.

Advantages

-
- It delivers better services to users as the information output is normally faster.
- The problem of the processor idle time is solved because the processor does not need to wait for the slower communication peripherals
- Files are held on-line hence inquiries are possible
- Helpful to small companies which cannot afford purchasing the computer and its related facilities

Disadvantages

- The users have got no control over the central computer
- The response time is also slow whenever there are many tasks

Centralized Processing

This involves all data or information being processed in a central place, such as a computer center at head office.

Advantages

- Having a central up-to-date set of data will be accessible by all departments
- Maintaining a single set of data which will eliminate inconsistencies in data used for different purposes.
- Centralization would also facilitate the standardization of applications.
- If one powerful computer is installed, the resultant advantages will be increased speeds in operation, storage capacity and processing capacity

Disadvantages

- Capital costs the back-up-system and the high costs of the main computer are both major factors.
- Increased operating costs for example telecommunications costs.
- The problem of being entirely dependent on one machine is a very risky scenario as failing
- would lead to serious consequences.

Distributed Processing:

This is a data processing mode where the system includes multiple computers linked by a communication network, allowing the processing to be "distributed" around the system. E.g. ATMs and banks in different regions.

Distributed processing is characterized by;

- Computers distributed or spread over a wide geographical area
- Processing of data at more than one location
- Shared data files
- Ability for each computer within the system to process data jointly or interactively

Advantages

- Less effort is expended on data transmission.
- Results may be obtained more quickly as data is processed locally.
- Speed of processing is improved and local priorities can be better satisfied.
- In case of a single machine failing, it would be reasonably easier to acquire another on a short term basis, and it would be able to be installed with a minimum of work.

Disadvantages

- Capital costs, involving acquisition of several minicomputers, will be high, although with phased regional implementation, this can be spread more easily than a single main frame purchase.
- Operation costs, particularly staff costs, will be high as it will be necessary to maintain a certain level of expertise at each regional office, resulting in some duplication.
- Installation of, and training on, new versions of software would take more time and cost more. In addition, the logistics of installing later releases of software would require careful monitoring.

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COMPUTER SYSTEM HARDWARE

A **computer** can be defined as an electronic machine, operating under the control instructions stored in its own memory, that can accept data, manipulate the data according specified rules, produce results, and store the results for future use. Computers process data create information. **Data** is a collection of raw unprocessed facts, figures, symbols. **Information** is data that is organized, meaningful, and useful. To process data information, a computer uses hardware and software. **Hardware** is the electric, electron and mechanical equipment that makes up a computer. **Software** is the series of instructio that tells the hardware how to perform tasks.

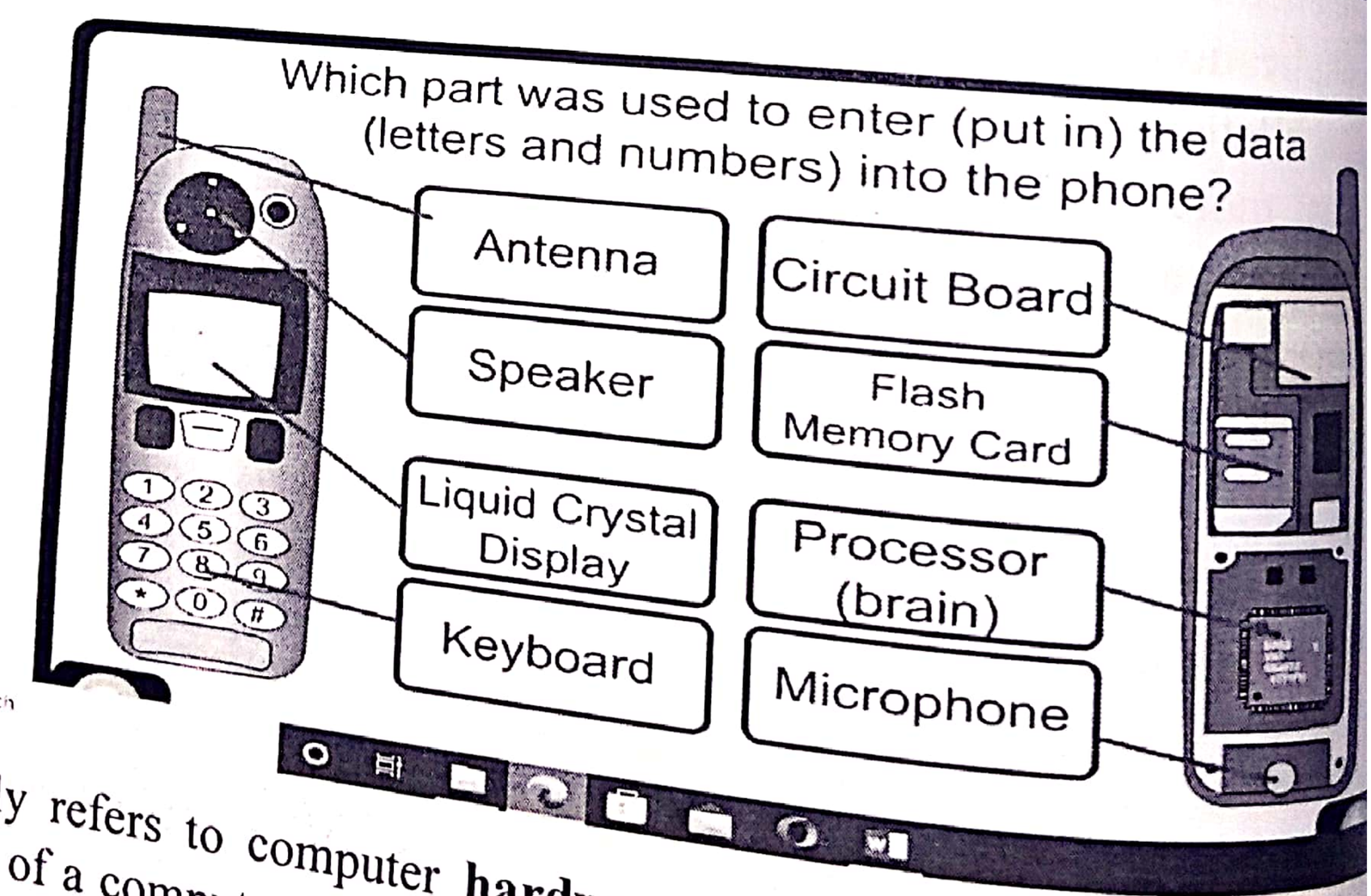
Computer is a machine/tool or device which accepts data or information in one form a process it to produce data or information in another form]Computer is an electron device/machine that takes in data, Processes them according to the given instructions a produces Information that is useful to the people (user).

What a computer do?

i. First Accepts data such as raw facts, figures, numbers, letters and symbol

ii. Then Processes data into information (Data that is organized, meaningful, and useful)

iii. Finally Produces and stores results



A computer system simply refers to computer **hardware** and **software**; where hardwa refers to the tangible parts of a computer i.e. parts that can be felt or touched plus any oth device that is physically connected to a computer (computer peripherals) and softwa referring to the non physical components of a computer.

There are 6 major components of a computer system i.e. input unit, processing unit (contr unit plus arithmetic and logic unit), output unit, storage/memory unit (primary and seconda memory), and communication unit.

Why a Computer is a Powerful Tool

A computer is a powerful tool because it is able to perform the information processing cycle operations (input, process, output, and storage) with amazing speed, reliability, and accuracy; store huge amounts of data and information; and communicate with other computers. Computers allow users to generate correct information quickly, hold the information so it is available at any time, and share the information with other computer users, Do not need supervision to be able to perform, they are artificially intelligent in that they perform the same tasks over and over again for long hours without getting tired,

Computer Hardware Devices

Computer hardware components include input devices, output devices, a system unit, storage devices, and communications devices.

An **input device** is any hardware component that allows a user to enter data and instructions into a computer. Six commonly used input devices are the keyboard, mouse, microphone, scanner, digital camera, and PC camera.

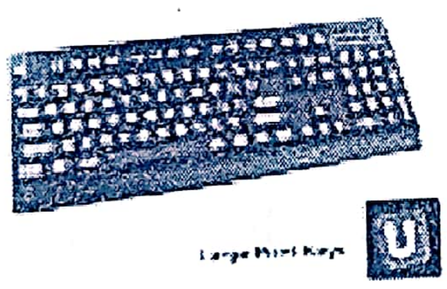
An **output device** is any hardware component that can convey information to a user. Three commonly used output devices are a printer, a monitor, and speakers.

Input devices

These are devices used in entering data. Note that the input could be text (numbers, letters, and formulae), images, sound etc.

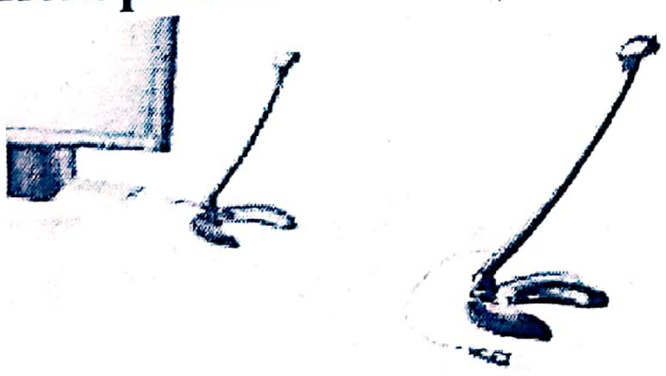
Examples include:

a. Keyboard



b. Mouse/Mice

c. Microphone



This device helps to input voice/sound. It can be used with a voice recognition system which processes the information. This can be used with a word processing program to enter text.

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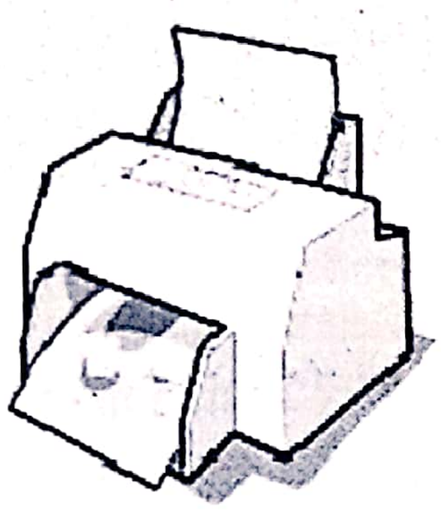
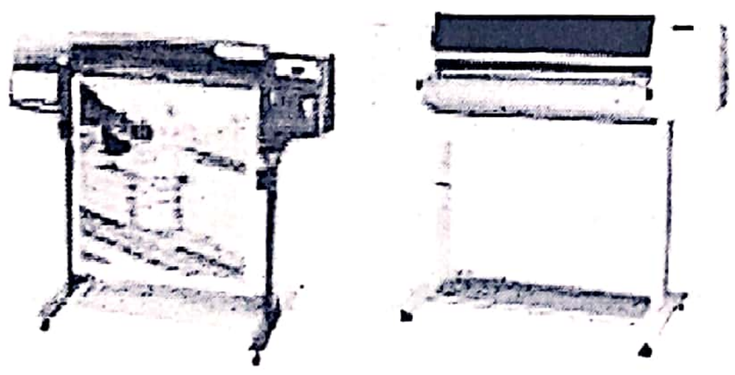
images in rapid sequence that gives the illusion of motion). **Audio** is music, speech, or any other sound. **Video** consists of images played back at speeds to provide the appearance of full motion. An **output device** is any computer component capable of conveying information to a user. Such devices include:

a. Printers

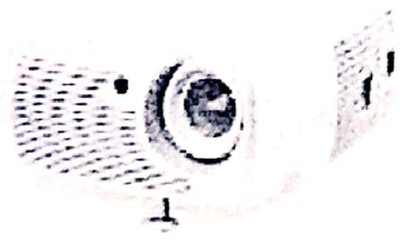


b. Plotters

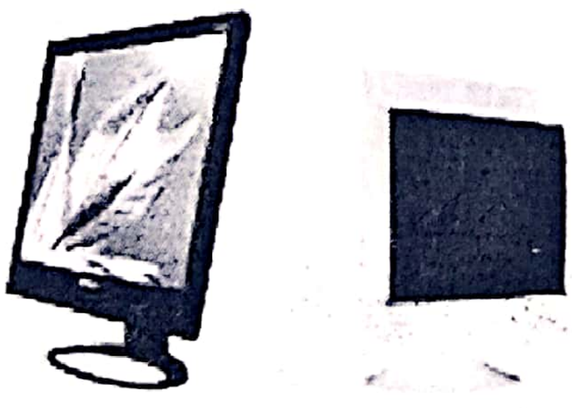


c. Display devices

d. Projectors



e. Monitor



f. Speaker/ Headphones

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Some speakers are inbuilt while others are separate. If your system has a sou it needs a pair of speakers/ headphones. **Headphones** are similar to the speaker that they are won on the ears so only one person can hear the output at a time.

Memory/ Storage Devices:

A **storage device** records and retrieves data to and from a storage medium. Six co storage devices are a floppy disk drive, a Zip® drive, a hard disk drive, a CD-ROM d CD-RW drive, a DVD-ROM drive, and a DVD+RW drive.

Memory is a temporary storage place for data, instructions, and information. Memory the operating system, application programs, and the data processed by application pro A byte is the basic storage unit in memory. Memory size is measured by the number of available for use. A **kilobyte (KB** or **K)** of memory is approximately one thousand a **megabyte (MB)** is approximately one million bytes, and a **gigabyte (GB)** is approxi one billion bytes. The system unit contains several types of memory.

Memory in a computer is classified into two forms.

1. **Primary Memory/Main Memory**
   This refers to the computer's internal memory. Primary storage is used to store data likely to be in active use. This location holds data for short periods of times i.e. processing. The primary/ main storage of the computer system has 2 sections i.e. and RAM

   RAM (Random Access Memory): The place in a computer where the operating s application programs, and data in current use are kept so that they can be quickly re by the computer's processor. It is the biggest section of the main memory consisting 70% of the main memory. It is the section of the main memory where users can change and even delete the information. It is a temporal section where information lost anytime if it has not been stored before. This section is therefore volatile contents can be lost by simply switching off the computer.

RAM is the name given to integrated circuits, or chips, that are used for main mem is the temporary memory that allows you to run applications. Programs that need saved should be transferred to secondary storage before the power is turned off. type of memory called **flash RAM** or flash memory can now retain data even wh power is turned off.

ROM (Read Only Memory):

ROM is the name given to chips that store information or instructions that do not change. An example would be the instructions and data used when a computer is first turned on. The contents of ROM memory are retained when the power is shut off, therefore it is nonvolatile.

It's the section of the main memory that stores information/ programs that can only be read or retrieved but not changed or altered. Programs/ instructions are stored permanently implying programs can't be lost by merely switching off the computer. Programs stored in this part of the memory include: Operating systems (programs that control the operation of the computer system like Windows, DOS, and Unix etc). ROM also stores system instructions and commands. This section is the smallest constituting about 30% of the main memory.

RAM, Flash RAM, ROM are examples of Primary storage devices.

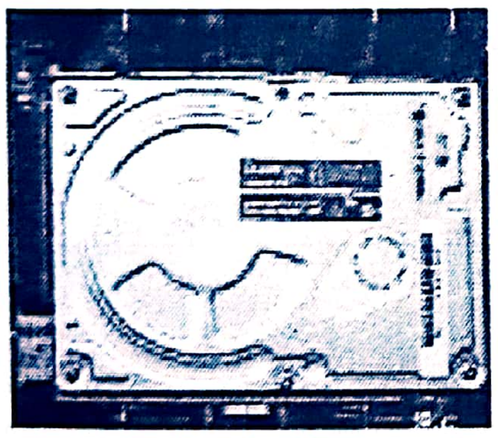
2. **Secondary Memory/ auxiliary storage**

This is used for permanent storage. The information here is kept intact even if power is switched off.

Secondary storage devices hold files that are not currently being used/ processed. For a file to be used it must be copied to the main memory first. After any modifications files must be saved to the secondary memory. Secondary storage is more permanent than main memory, as data and programs are retained when the power is turned off.

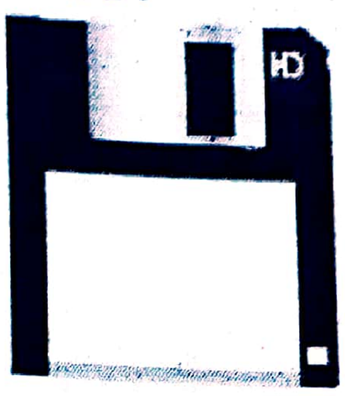
There are a number of devices that can be used for storage of information permanently. These include:

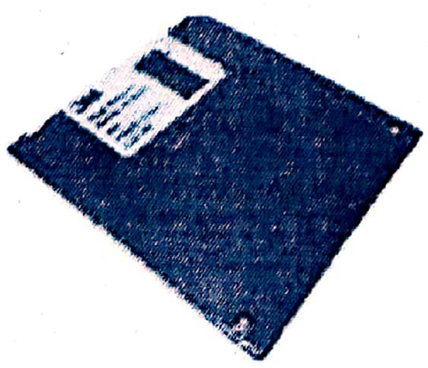
. **Hard disks**



These are storage devices that are permanently installed inside a computer. The computer can accommodate more than one hard disk. Each hard disk is given an identity code e.g. C; D etc. The computer can then be able to recognise each disk according to its code. These devices are very strong and usually last a long time.

i. **Floppy disks**





These are small devices with a memory of **1.44 MB**. It is however fragile (easily spoilt) and it is not recommended for long term and reliable

PROCESSING DEVICES

Components / Elements of CPU

1. Control unit (CU)

Responsible for the following functions;

1) Coordinating the input and output devices.
2) It directs the flow of data from the CPU and input and output devices.
3) Tell the rest of the computer system how to carry out a program instruction.
4) Directs the movements of electronic signals between main memory and logic un
5) Directs electronic signals between main memory and the input/output devices.

2 Arithmetic/Logic Unit (ALU)

ALU is responsible for the following functions;

1) The ALU performs all calculations and logical decisions in the computer system , /, * etc and what if analysis in Excel.

2) Control operations of those operations.

3, Registers

Immediate Access storage (Register): Is a very small amount of very fast memory tha into the CPU (central processing unit) in order to speed up its operations by providi access to commonly used values Registers are used to store data during the execut program.

- Register is contained in CPU-in arithmetic logic unit. They are temporary mem store data temporarily during processing
- Provides working area for computation
- Hold programs instructions and data from main memory into registers jus processing.

The CPU Speed

The speed of CPU is measured in HERTZ (Hz), i.e., number of operations can be c second. Nowadays, we usually use KHz, MHz, GHz (e.g.700 KHz, 300 MHz, 3.0 GHz)

Functions of CPU

1.Control the sequence of operation
2.Give commands to all parts of the computer system, Like keyboard, mouse, Printer. etc
3.Interpret and execute program instructions (software)
4.Communicate with the input device and storage device

Communication Devices:

A **communications device** enables computer users to communicate and exchange items such as data, instructions, and information with another computer. A **modem** is a communications device that enables computers to communicate usually via telephone lines or cable.

Modem

Modem is short form for MOdulator, DEModulator. A hardware that lets one computer talk to another computer over a phone line. Modems are typically used to link computers via telephone lines. A modem converts the digital signal from a computer to an analogue signal that can be transmitted along an ordinary phone line and vice versa (i.e. the signal is again converted back from analog to digital) for the receiving computer to understand.

Codec

A codec is a device or program capable of performing encoding and decoding on a digital data stream or signal. The word codec may be a combination of any of the following: 'compressor-decompressor', 'coder-decoder', or 'compression/decompression algorithm'.

Network card

It is also called network adapter, network interface card (NIC). It is a piece of hardware designed to provide for computer communication (i.e. enabling a computer communicate with other computers) via a direct network connection.

Buses

A bus is a channel (or shared data path) through which data are passed in electronic form. Three types of buses link the CPU, primary storage, and the other devices in the computer system. The capacity of a bus, called bus width, is defined by the number of bits they carry at a time.

1. Data Bus, moves data to and from the primary storage
2. Address Bus, transmits signals for locating a given address in primary storage
3. Control bus transmits signals specifying whether to read or write data to or from a given primary storage address, input device or output device.

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COMPUTER CLASSIFICATIONS

THERE ARE THE DIFFERENT CATEGORIES OF COMPUTERS. COMPUTERS CAN BE GENERALLY CLASSIFIED INTO FOUR CLASSES. BASIC COMPUTER CLASSIFICATION INCLUDES.

- CLASSIFICATION BY PROCESS
- CLASSIFICATION BY PURPOSE
- CLASSIFICATION BY PROCESSOR POWER
- CLASSIFICATION BY SIZE

CLASSIFICATION BY PROCESS

UNDER THIS CLASSIFICATION COMPUTERS ARE CLASSIFIED ACCORDING TO HOW THE DATA PROCESSED IS PRESENTED. THIS CLASSIFICATION IS FURTHER DIVIDED IN TO 3 SUB CLASSES WHICH INCLUDE;

- DIGITAL COMPUTERS
- ANALOGUE COMPUTERS
- HYBRID COMPUTERS

DIGITAL COMPUTERS

These are computers designed to process data in numerical or discrete form. The numbers operated on by a digital computer are expressed in the binary system; binary digits, or bits, are 0 and 1. Applications of digital computers are used for reservations systems, data-processing, word-processing applications, desktop publishing, electronic games and many other purposes

ANALOGUE COMPUTERS

These are computers that process data that's in a continuous form or measurable quantities/units. For example pressure, electrical voltage. The output from these computers is often in form of smooth graphs from which information can be read. Examples of analogue computers include those used in thermometers, voltmeters and speedometers etc.

HYBRID COMPUTERS

Hybrid computers are those that have the combined features of both the digital computers and the analogue computers. This means they can present data in numerical form as well as continuous form. Examples include the common microcomputers.

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CLASSIFICATION BY PURPOSE

The hybrid computers can be classified according to the work they are intended to perfor gives us 2 categories;

- **SPECIAL PURPOSE**
- **GENERAL PURPOSE**

SPECIAL PURPOSE COMPUTERS

These are computers designed to handle only a particular task. their form of operati restricted in nature, e.g. computers that are used in digital watches, lifts in tall build petrol pumps, missiles. these computers cannot perform any other task other than what have been designed for. for example, computers embedded in missiles cannot perform other duty other than weapon guidance.

GENERAL PURPOSE COMPUTERS

unlike special purpose computers general-purpose computers can be adopted to perform task or solve specific problems by means of specially written programs. for example a ty computer of this type can perform calculations, keep data, time, word process a docum store data bases etc. previously, computers used to be classified according to the pur they were used. e.g. word processing computer

CLASSIFICATION BY PROCESSOR POWER

computers can also be classified according to the power of the processor (cpu). proce power is the ability of the computer to process data at very high spe with new changes in technology, processor power has also rapidly increased; computers getting faster and faster each year. the higher the processor power the higher the speed of computer. this speed is measured in seconds or microseconds. computers with processing power require more system resources. e.g. system memory capacity, hard space, modern programs etc. all this combined together make computers with hi processing power better productive tools. e.g. super computers. examples of processor are

- 80286 ,80386, 80486, Pentium I (80586), Pentium II, Pentium III, Pentium IV, Celeron, Duo core Processor

Processor Power and Voltage

In the early days of computers, there wasn't very much concern about how much po processor used. There weren't as many of them, and we weren't doing nearly as much with We were just thrilled they existed at all! As time has gone on our demands on these ma

have continued to increase and new uses have put power consumption in the spotlight. This has led to a confusing set of voltage specifications where before (up to the Intel 486DX2-66) everything ran on 5 volt power.

The power usage and the voltage support of a processor are important for the following reasons:

- Power consumption equates largely with heat generation, which is a primary enemy in achieving increased performance. Newer processors are larger and faster, and keeping them cool can be a major concern.
- With millions of PCs in use, and sometimes thousands located in the same company, the desire to conserve energy has grown from a non-issue to a real issue in the last five years.
- Reducing power usage is a primary objective for the designers of notebook computers, since they run on batteries with a limited life. (They also are more sensitive to heat problems since their components are crammed into such a small space).

Newer processors strive to add additional features and to run at faster speeds, which tends to increase power consumption. Processor designers compensate for this largely through technology, by using lower-power semiconductor processes, and shrinking the circuit size and die size.

CLASSIFICATION BY SIZE

General-purpose computers can be further sub divided depending on the size of the machine from the smallest size to the biggest size. They are mainly categorized as

- Main frames
- Mini computers
- Micro computers
- Super computer

Mainframe Computers

These are larger general-purpose computers with extensive processing, storage, input and outpu capabilities. As the size of computers has diminished while the power has increased, the terr mainframe has fallen out of use in favor of enterprise server. They can accommodate many use at a time e.g. 500-1000 users at a time where by each user works separately with a separate ke board and monitor but they all use the same processor. They are costly and mainly used by larg multinational companies, software houses or central governments.

MINI COMPUTERS

a minicomputer is a multi-user computer that is less powerful than a mainframe. t possess the same working principle as the mainframe computers but are slightly smaller the main frames. they have high processing, storage, input & output capabilities compar microcomputers. they are mainly used by big organizations, ministries, banks, government organisations to handle big databases. minicomputers are now referred t mid-range servers.

MICRO COMPUTERS

These are much smaller compared to the mainframe and mini computers. They are desig to handle less tasks or jobs with minimal processing, input, and output capabilities. They single user in terms of user capacity. One person can use the keyboard, CPU and monitor time. They are cheaper to acquire and maintain than the bigger computers. Examples ra from palmtops-desktops. Popular uses for microcomputers include word processing, sur the web, sending and receiving e-mail, spreadsheet calculations, database managem editing photographs, creating graphics, and playing music or games.

Examples of Microcomputers

- **Desktop computers;** these are designed to be stationed in one place or on the desk hence name.
- **Laptop computers;** these are microcomputers used on top of people's laps; they are porta smaller and are therefore good for field work.
- **Notebook Computers** these are very small computers the size of a notebook. They are sma than laptops but bigger than palm tops portable and good for field work.
- **Palmtop or handheld PC**; A palmtop or handheld PC is a very small microcomputer that sacrifices power for small size and portability.
- **Personal Digital Assistant (PDA);** handheld microcomputer that trades off power for small and greater portability. They typically use a touch-sensitive screen for both output and input.
- **Wearable computers;** are designed to be worn and used on the body.
  - The latest trend in computing is wearable computers with essentially comm applications like email, multimedia, and calendar schedules. They can be integra into watches, cell phones, and even clothing.
  - **Watch** to measure your stress levels. This has sensors that gather information ab the user and his/her environment.
  - **Pop gadget**; a device used to warn one that they are in danger losing the attention the crowd.
  - **Video eyeglasses**; used to watch video screen from a distance of about six feet. display video on one eye, leaving the other free to look out to something else.
  - **Wearable GPS**; for hikers, tourists or just about anyone who likes to travel w light load while taking digital photos, Wearable GPS tracking device that'll help

COMPUTER SYSTEM EVOLUTION

Computer system evolution looks at the different classification of computers as they ev each generation of computer is characterized by a major technological developme fundamentally changed the way computers operate, resulting in increasingly s cheaper, and more powerful and more efficient and reliable devices. the evolution is fr 1st generation to the 5th generation.

FIRST GENERATION: VACUUM TUBE (1940-1956)

The 1st generation of computers relied on vacuum tubes to store and process inform These tubes were colossal in size, consumed a great deal of power, were short-live generated a great deal of heat. 1st generation computers had extremely limited memo processing capability and were used for very ltd scientific and engineering work. Pu cards were used for external storage. Machine and assembly languages were usec UNIVAC and ENIAC computers are examples of first-generation computing devices.

SECOND GENERATION: TRANSISTORS, (1956-1963)

Here, transistors replaced vacuum tubes as the devices for storing and

Processing information. They were smaller and more reliable than vacuum tubes generated less heat, and consumed less power. 2nd generation computers had e memory and processing power to be used more widely for scientific work and for bu tasks such as automating payroll and billing. Magnetic tape was the common e storage. Assembly language was used in this generation. Important commercial machi this era include the IBM 704 and its successors, the 709 and 7094.

THIRD GENERATION: INTEGRATED CIRCUITS, (1964-71)

The development of the integrated circuit was the hallmark of the third generat computers. Instead of punched cards and printouts, users interacted with third gene computers through keyboards and monitors. This allowed the device to run many di applications at once. Computers for the first time became accessible to a mass au because they were smaller and cheaper than their predecessors. During this generation high level programming languages were introduced, including BASIC, FOR (FORmular Translator) and COBOL (Common Business Oriented Language).

FOURTH GENERATION; MICROPROCESSORS (1980-TO PRESENT)

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The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room can now fit in the palm of the hand. Computers became smaller, faster, more reliable and lower in price. In 1981 IBM introduced its first computer for the home user. As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet.

FIFTH GENERATION; ARTIFICIAL INTELLIGENCE (PRESENT AND BEYOND)

Fifth generation computing devices, based on artificial intelligence, are still in development. They have some applications, such as voice recognition. There is widespread use of computer networks and the increasing use of single-user workstations. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning.

COMPUTER ACQUISITION METHODS

These are the methods one can use to acquire a computer. There are various acquisition methods, namely direct purchase, rental method, hire purchase and leasing. To these can be added the decision to outsource the entire operation of the system to a facilities management company or computer bureau. Basing on the situation, each of the methods can be better than the other in one way or another.

DIRECT PURCHASING

This is where a computer facility is acquired through payment of cash to the owner. The computer facility becomes the asset of the buyer immediately after payment.

Advantages

- *The computer facility becomes asset of the buyer; hence complete control.*
- *The computer facility can be used to acquire loans (security for a loan).*
- *The facility becomes cheaper in the long run in terms of the acquisition cost.*
- *The choice of the computer facility lies on the purchaser.*
- **No restrictions on use.**

Disadvantages

- *Very costly as the initial costs of purchase are normally high*
- *The maintenance costs are also high*
- *In case of any loss of the computer facility, the buyer becomes affected directly.*
- *The computer facility may be affected by changes in technology and in the end it may become outdated.*

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RENTAL METHOD

this involves a fixed charge payable to the owner over a short period for example, weeks or months. the computer facility is supposed to be returned after that period.

ADVANTAGES

- The rental fee is small compared to the outright purchase.
- Maintenance of the computer facility is the responsibility of the owner.
- In case of any eventuality like loss of computer facility, the organization or renting is not directly affected.
- Obsolescence is not a concern to the person renting.

Disadvantages

- The computer facility does not become an asset to the organization or the renting.
- Continuous renting becomes expensive in the long run.
- The computer facility can't be used to mortgage a loan.

LEASING METHOD

a leasing arrangement means that the lessee uses the equipment for a defined period o for the payment of a fee to the lessor. the lessee enters an agreement with the lessor, binds the lessee to the computer facility to be acquired in a specified period.

Advantages

- It's cheaper compared to both rental and direct purchase methods.
- The time period enjoyed by the lessee is greater than the period under arrangements.
- The lessee has more time to utilize the facility to gain a competitive advantage com to rental method.

- Obsolescence is not a concern of the lessee as there is lesser danger.

Disadvantages

- The computer facility doesn't become asset to the lessee.
- The lessee incurs maintenance costs and is eventually liable to pay in case of loss of the computer facility.
- The computer facility cannot be used for mortgaging loans under this arrangement.
- It may be impossible or costly to terminate a leasing contract

HIRE PURCHASE

This is the procedure of purchasing goods under which the purchaser pays a deposit on the receipt of goods followed by a number of installments until the debt is cleared.

Before clearing the debt, the asset belongs to the seller.

Advantages

- Payments are made in smaller regular installments, so not strenuous.

Disadvantages

- The goods don't become a property of the purchaser until the last installment has been paid
- Costly in the long run

USING A COMPUTER BUREAU

Computer bureaus are organisations which provide computer facilities to clients in areas of basic data processing. The computer facilities are often at a smaller fee to the clients. The range of services offered by a computer bureau range from small service to complete service e.g. secretarial, payroll production, word processing etc.

Advantages

- It's the cheapest way of acquiring computer services.
- Firms or clients can use computer bureau in case of peak loads in organisations.
- It's faster at processing clients or organization's work since the staff are experienced.
- Clients without the necessary expertise can utilize the expertise of computer bureau staff.
- Clients or organisations without computer facilities easily perform their functions at a computer bureau.

Disadvantages

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COMPUTER SOFTWARE

Software refers to the nonphysical components of a computer. It is machine intelligence in form of written programs/ instructions/procedures that cause the hardware to work. It is these set of instructions that help the computer to process data and give information. In other words, software will basically instruct/tell a computer what to do.

There are two categories of computer software: system software and application software. **System software** consists of the programs that control the operations of a computer and its devices. Two types of system software are the operating system and utility programs. An **operating system (OS)** coordinates all activities among hardware devices and contains instructions that allow you to run application software. A **utility program** performs specific tasks

, usually related to managing a computer, its devices, or its programs. You interact with software through its user interface.

Application software consists of programs that perform specific tasks for users. Popular application software includes word processing software, spreadsheet software, database software, and presentation graphics software. Application software can be **packaged software** (copyrighted software that meets the needs of a variety of users), **custom software** (tailor-made software developed at a user's request), **freeware** (copyrighted software provided at no cost), **public-domain software** (software donated for public use with no copyright restrictions), or **shareware** (copyrighted software distributed free for a trial period).

The preparation of programs is done by humans called **Programmers** and the act is called **Programming**.

Note: The other systems that we work with like Radio/music systems, Type writers, Television systems do not require software to operate; however, the computer system cannot be able to execute any command without software. It's the software that empowers the computer hardware. This therefore implies that without the software the computer hardware can not be able to work.

Starting a Computer

When you turn on a computer after it has been powered off, you are performing a **cold boot.** When you restart a computer that already has been powered on, you are performing a **warm boot.** Your typically can perform a warm boot by pressing a combination of keys on the keyboard (in Windows, CTRL+ALT+DEL), selecting options from a menu, or pressing a Rese button on the com

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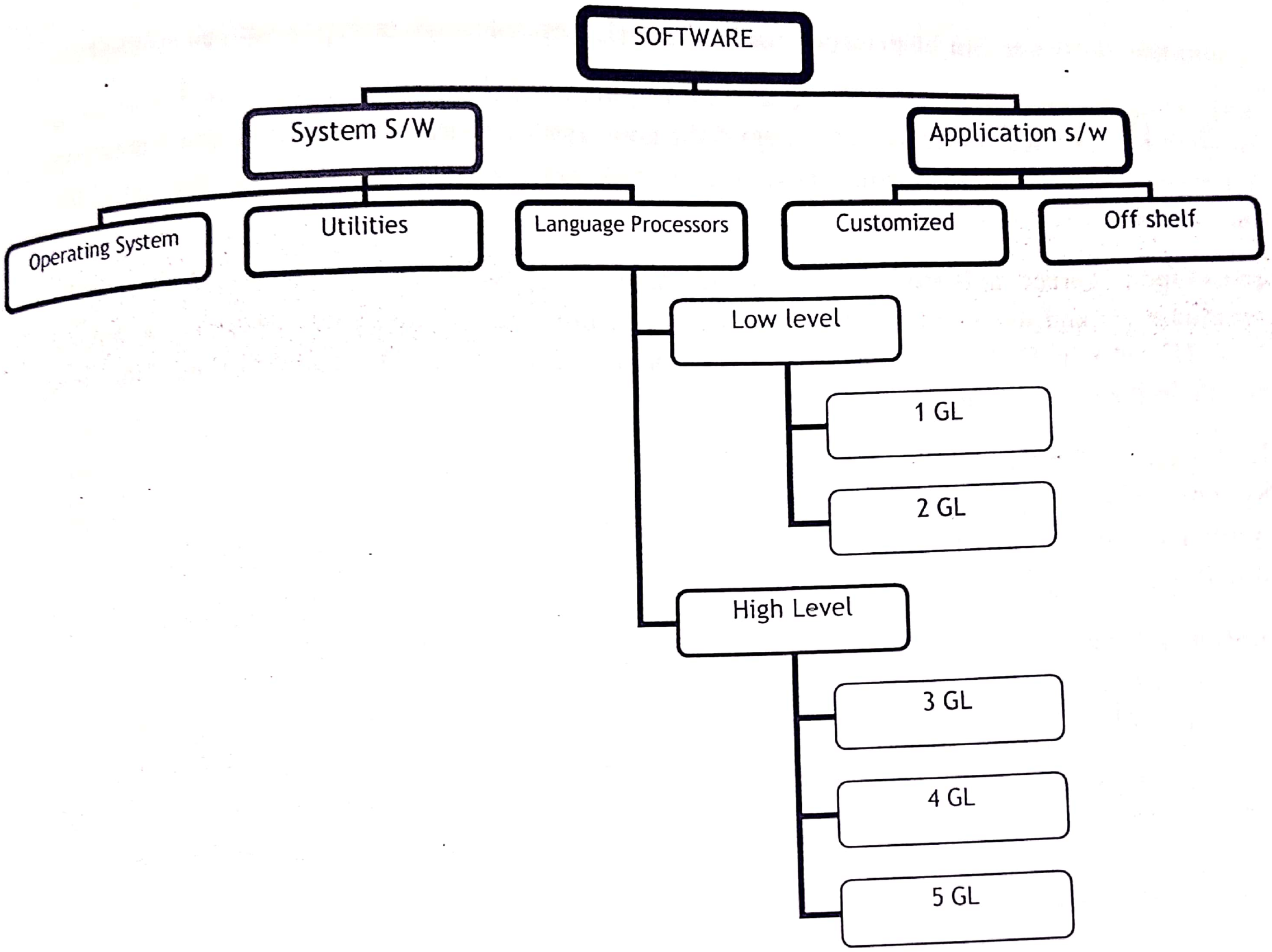
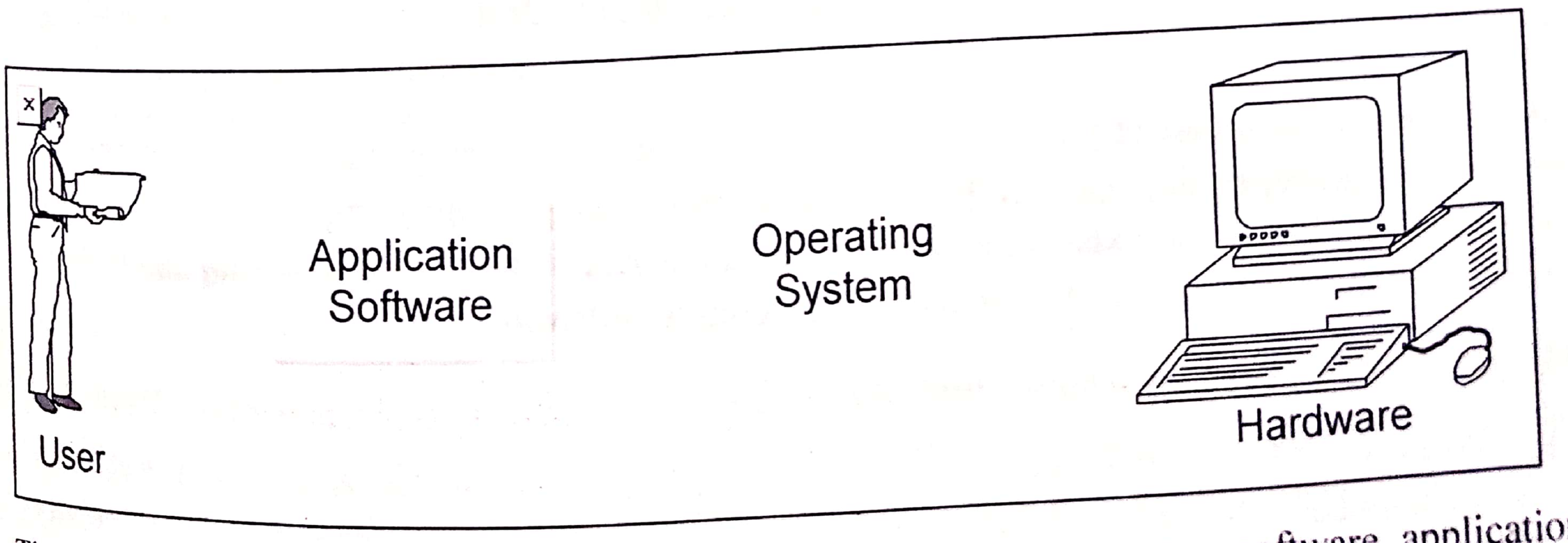


Software is categorized into two:

- System software
- Application software



The diagram above illustrates the relationship among the hardware, system software, application software and users.

Computer software can be grouped under Proprietary Software or Open source soft

(A). Proprietary software is the one that is purchased from a programming house programmer at a fee with associated copyright laws. Before a user installs it, he/she has for it and also accept the copyright laws, for example not to modify it without permission programmer.

(B). Open source software on the other hand is software that is developed by programmers and users are allowed to install it at almost no charge (they only pay a s fee). The users are also allowed to modify the software and share the modifications with people in the society that programmed it.

1. System Software

System software refers to the various programs that control and support operations computer system. They are any computer software whose purpose is to help run the com system.

System software is composed of the following:

1. Operating system
2. Programming language processors/translators.
3. Utilities

1. Operating System

An operating system is the type of system software supervising and directing all of the software components plus the computer hardware.

This special computer program manages the relationship among application softwar wide variety of hardware that makes up a computer system, and the user of the system.

It's the master controller of all activities that take place within a computer. It is some referred to as the supervisor/ executive since it coordinates the whole computer system.

It's the most important program that runs on a computer. Every general-purpose com must have an operating system to run other programs. It's also important to note Operating Software can exist on a computer without Application software while applic software cannot run on a computer without Operating Software.

Examples of Operating systems include;

a) **Windows (Microsoft Windows):** Windows was developed by Microsoft and is today most popular O/S for businesses and home PCs. This is because it is very user frie because of its Graphical User Interface (GUI) and has encouraged numerous people to computers. It allows you to do more than one thing at a time.

Windows has several versions including:

b) **DOS (Disk Operating system):** It is a single tasking O/S, command line oriented and not user friendly. DOS is commonly used on personal computers, normally stand alones. There are two types of DOS i.e. PC DOS developed by IBM Corporation and MS DOS by Microsoft.

c) **UNIX:** an advanced O/S more suitable for network use. UNIX is popular among large organisations particularly those with I.T. backgrounds. It is the best multi-user, multitasking O/S with extensive stability. Most web servers still utilize UNIX therefore it is a Network Operating System (NOS). It has support for a wide range of software. Unfortunately, it works like DOS being command line based.

d) **Linux:** a UNIX based O/S best described as the G.U.I. version of Unix. It is more user friendly than its parent O/S. It allows you to perform more than one task at a time. Linux is an example of open source software and the source code can be modified by developers to fit their particular needs.

e) **Mac:** The Mac O/S is only used in Macintosh computers. It is user friendly with support for high graphics handling. It is also suitable for multitasking.

f) **Windows CE (Compact Edition), EPOC and Palm OS:** specifically developed for the PDA'S/Hand held computers. Normally these OS are automatically installed in the computer's ROM-BIOS.

g) **OS/2:** Another desktop operating system which offers multi-tasking abilities.

h) **BeOS (Be Operating System):** Its one of the recent developments in operating system which was built due to the increased demand in the multi-media industry for robust and larger file handling abilities. It is ideal for handling files that include video, sound and three-dimensional images.

i) **Novell Netware:** This system boosts the NetWare directory service. The NetWare directory service maintains a directory of network resources and gives access to authorized users only. It's useful in interconnected areas. The applications and services can be offered to groups or on one clientele basis.

Other operating systems

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These include operating systems designed specially for particular computer by manufacturers' e.g.

j) The Macros for macros 85
k) The ARCON risk for machines that use the ARCON risk processor
l) CP/N (control program for micro computer) by digital research
m) System 7 for the apple Mac computers etc.
n) Android for Smart phones

Functions of the operating system

i. It does the initial setting up of the computer after switching on. It is the operating sy that loads itself automatically into RAM and runs the computer and sets it up rea some one to use.

ii. It determines the interface of the desktop. Some operating systems are command b and thus require one to type in commands (e.g. DOS) while others use graphics/pic (E.g. Windows XP).

iii. It coordinates the computer hardware e.g. the keyboard, printer, memory, monitor an application software.

iv. It checks whether the computer hardware and peripherals are functioning properly, proper connections, proper usage (e.g. whether the computer has been shut down the way) etc. It also displays messages to alert you on such things.

v. It manages multi-tasking (doing many tasks at once e.g. printing, inputting processing) and multi-programming (a technique of having more than one program i main/primary storage, which programs may be to running/are being processed a same time). For example, having a word document and an excel spreadsheet open a same time.

vi. Controlling system security by maintaining the use of passwords. A password is a characters which may be allocated to a person or facility which is required to be in into the system before further access is permitted.

vii. File management; Opening and closing of files. When files are deleted, the OS organizes the storage such that the remaining space is available for use.

viii. It enables loading of programs into and out of memory from time to time i.e. copi rest of the OS from secondary storage into RAM

ix. Loading of files/ programs from external storage into memory/hard disk.

x. Supervises and directs other programs of the computer system.

xi. Ensures the automatic update of time and date on the computer

UTILITIES/SERVICE PROGRAMS

These are programs specifically designed to enhance/tune the performance of the operating system. Utilities perform very specific tasks related to managing system resources. Utilities differ from application programs mostly in terms of size and complexity. E.g. Word processors, spread sheets are considered applications because they are large programs that perform a variety of functions not directly related to managing computer resources.

They perform functions of routine nature i.e. functions that may be required by a number of other programs in a number of circumstances. They are tools used in file maintenance and manipulation.

These programs include:

a) **Sort utility**: This is a program that arranges records in a pre-determined sequence. The sort programs are normally used to sort files into a specific sequence to ease their access.

b) **Tracing and Debugging**: This is a program that enables tracing of errors in the program and after such errors are located, they are eliminated in a process called debugging. A Bug is a mistake/error in a computer program.

c) **Rename utility**: These are programs that enable one to rename files.

d) **Delete utility**: These are used to delete files and unwanted sentences in a document.

e) **File maintenance**: A program designed to carry out the process of insertion or deletion of records in any file for proper maintenance.

f) **Virus checkers**: These check for viruses the computer may have received from downloading information from the internet, e-mail or other disk media.

g) **Merge utility**: Programs that merge/combine files from different destinations into a single destination.

h) **File copying utility:** it is a program which simply copies data from one media to another e.g. from a disk to a magnetic.

i) **Resource usage utility:** for logging in networking

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j) **Editors**: These programs provide facilities for the creation or amendments of pr
If you want to make changes to a program, you use a program called editor to h
edit the other

3. PROGRAMMING LANGUAGE PROCESSORS

a) Programming Languages:

These are languages used by programmers to write instructions understood
computer. There are over 150 programming languages in existence.

Programming languages can be categorized into:

i. Low level languages
ii. High level languages

i. **Low level languages**
These are languages that can easily be understood by the computer hardware. Ex
include: machine language and assembly language.

ii. **High level languages**
These are languages that are nearest to human language and easily underst
programmers. They are also called English oriented languages

High level languages make complex programming simpler, while low level la
produce more efficient code.

However, it is important to note that high level languages must always
translated to machine language before execution.

Note:

There is only one language that computers are capable of understanding without
of translation programs i.e. machine language. However, computers are
understand the rest of the programming languages through what we call la
processors.

b) Language processors

These are programs designed to help in the translation of other programming lan
into machine language to be understood by the computer.

Examples of language processors include:

i. **Assemblers**: These translate assembly instructions into machine code.
ii. **Compilers**: These translate programs written in high level language to m
language. A compiler translates a program all at once and produces a complete m
language. The entire program is translated into machine code at compilation time
iii. **Interpreters**: A special program that can be used to translate high level langua
machine language which can be understood by the computer. Unlike the compil
translates a program all at once, an interpreter translates instruction by instructio

therefore it's slower. Interpreters can also let you use a machine language program meant for one type of computer on a completely different type of computer.

iv. **Linker:** Computer programs are usually developed in modules or sub routines giving program segments meant to carry out the specific relevant tasks, during the program translation into their machine code notations. These modules are translated separately to their object code equivalents. The **Linker** is service software that accepts the separately translated program modules as its input and logically combines them into one logical module known as the load module that has got all the required bits and pieces for the translated program to be obeyed by the computer hardware.

Generations/Classification of computer languages

Computer languages are broadly classified into two, i.e. Low level and High level languages. These broad classifications are further classified into five generations;

1.Low Level Languages

a) **1st Generation languages (1GL) - Machine languages**

The first generation languages are low level languages that are **machine language**. They are sometimes called machine code or object code.

A computer can only deal with data and program instructions which are in binary form (1's & 0's) this thus implies that machine language is the language that is directly understood by the computer.

Advantage of machine language

- Programs written in machine language can be executed very fast by the computer. This is mainly because machine instructions are directly understood by the computer and no translation program is required.

Disadvantages of machine language

- It is difficult to program in machine language since instructions are written in only binary codes.
- The process of programming is very slow thus consuming a lot of time.
- Programs are more prone to errors.
- It is difficult to correct and modify machine language programs. Checking machine language instructions to locate errors is as difficult as writing them initially
- The language is machine dependent i.e. because of the internal design of every model of computer; machine language may differ from computer to computer.

Machine language is very difficult to humans in other words working with such kind of code is not for every body and as a result 2nd Generation Languages had to be adopted.

b) **2nd Generati**

These are also low level languages that generally consist of **assembly langua** known as sym bolic languages). It is an intermediate language very close to ma language. Assembly languages were developed to reduce programming complexi provide some standardization.

Assembly language uses structured commands as substitutions for numbers all humans to read the code easier than looking at binary codes. Human readable sy called mnemonics are used to represent a group of words E.g.

- ADD to mean Add
- SUB to mean Subtract
- COMP to mean Compare
- STC to mean Store Character
- MVE/MOV to mean Move characters
- CR to mean Compare Registry etc

Advantages of assembly languages

- Is more human readable thus easier to understand than machine languages.
- They operate efficiently as compared to high level languages though not as effi as machine languages.
- Are easier to debug as compared to machine languages.
- The language has a translation program (assembler) used to translate it to mac code.

Disadvantages of assembly languages

- The language is written at a level that machines cannot understand
- They are usually very long
- They are not so user friendly as compared to languages that use structured Engli
- Are machine dependent i.e. because of the internal design assembly language c be transferred from computer to computer.
- Are still complex though less abstract than machine.

2.High Level Languages

High level languages are classified according to whether they solve general pro **(procedural languages/3GL)** or specific problems **(Problem Oriented languages/4G**

c) 3rd Generation Languages (3GL) / Procedural languages

These are general-purpose programming languages called procedural languages/3GLs are designed to express the procedure of a problem; and because of their flexi procedural languages are able to solve a variety of problems.

They are **high level languages** where the instructions are given using words such as SUBTRACT, INPUT, PRINT, GOTO, READ etc. They were introduced as a ... of the assembly language. (This is advancement from the use of ...

- BASIC (Beginners All-purpose Symbolic Instruction Code)- Teaching language. Developed in 1964 by John Kemeny and Thomas Kurtz
- COBOL (Common Business Oriented Language) - mainly used in business because it handles files very well. Developed in early 1960s
- FORTRAN (Formula Translation) – developed in 1956 and used by scientists and mathematicians.
- PASCAL, developed by Blaise Pascal in 1960s for teaching sound programming practices
- C; developed by AT & T's Bell Labs in early 1970s, used by Professional Programmers to develop OS and application software.
- C++, Object-oriented version of the C programming language. It has all the capabilities of C plus additional features for working with software objects. C++ is used for developing application software.

Advantages of procedural languages

- Program statements resemble English and hence easier to work with.
- Because of their English like nature less time is required to program a problem
- Once coded, programs are easier to understand and modify
- They are machine independent.

Disadvantages of procedural languages

- Programs execute more slowly

d) **4th Generation Languages (4GL)/Problem oriented languages**

These are at times referred to as **very high level languages**. They are languages closer to human languages than typical high level languages. A typical 4GL command is: *Find all records where name is "smith".*

Using this language makes programming less prone to errors. One does not need to know the details of the actual code. The program concentrates on defining to the computer what must be done with less emphasis on how it should be done. It is then upon the intelligent computer and interpreters to determine how the job will be performed.

Fourth generation languages are commonly used in database programming and scripts. Examples of 4GLs are:

- SQL (Structured Query Language)
- Oracle
- Java
- Progress 4GL
- Focus.

Advantages of Problem oriented languages

- Program statements are in English and hence easier to work with
- Less time is required to program a problem
- Programs are easier to understand and modify
- They are machine independent.
- Using this language makes programming less prone to errors

Disadvantage of Problem oriented languages

Because the computers do not understand human languages, the programs execute s

e) **5th Generation Languages (5GL)**

These are referred to as natural languages. They are languages normally used in d of Artificial Intelligent programs that mimic human beings e.g. Robots, a computer games like chess and knowledge based/expert systems where computers programmed to make decisions in real life e.g. helping a doctor to diagnose disease on symptoms. Unlike the 4GL that manipulates figures, 5GL manipulates facts and a conclusion.

Fifth generation languages may also contain visual tools to help develop a Examples of 5GL are Visual Basic, LISP and PROLOG.

f) **HTML (Hyper Text Mark-up Language)**

This is one of the main programming languages used in creating web pages internet/intranet. This language allows programmers to compose text or data, sounds and videos etc on the screen display. It also allows the programmer attachments, which enable linkage to different web pages on the Internet.

2. APPLICATION SOFTWARE

They are programs written by the user or professional software houses to solve problems. They are designed to solve user problems of a general nature (for user common and popular objective) e.g. producing a document, making computations, business posters, coming up with a database or website, accounting purposes etc).

Application programs like word processors, presentation software, graphics software sheets are used to accomplish such tasks.

They are designed in such a way that they can be used on a range of computer systems data can be transferred from one PC to another.

Application software consists of programs which carry out a task for the user as op system software which consists of programs that control the workings of the computer.

Application software is categorized into two:

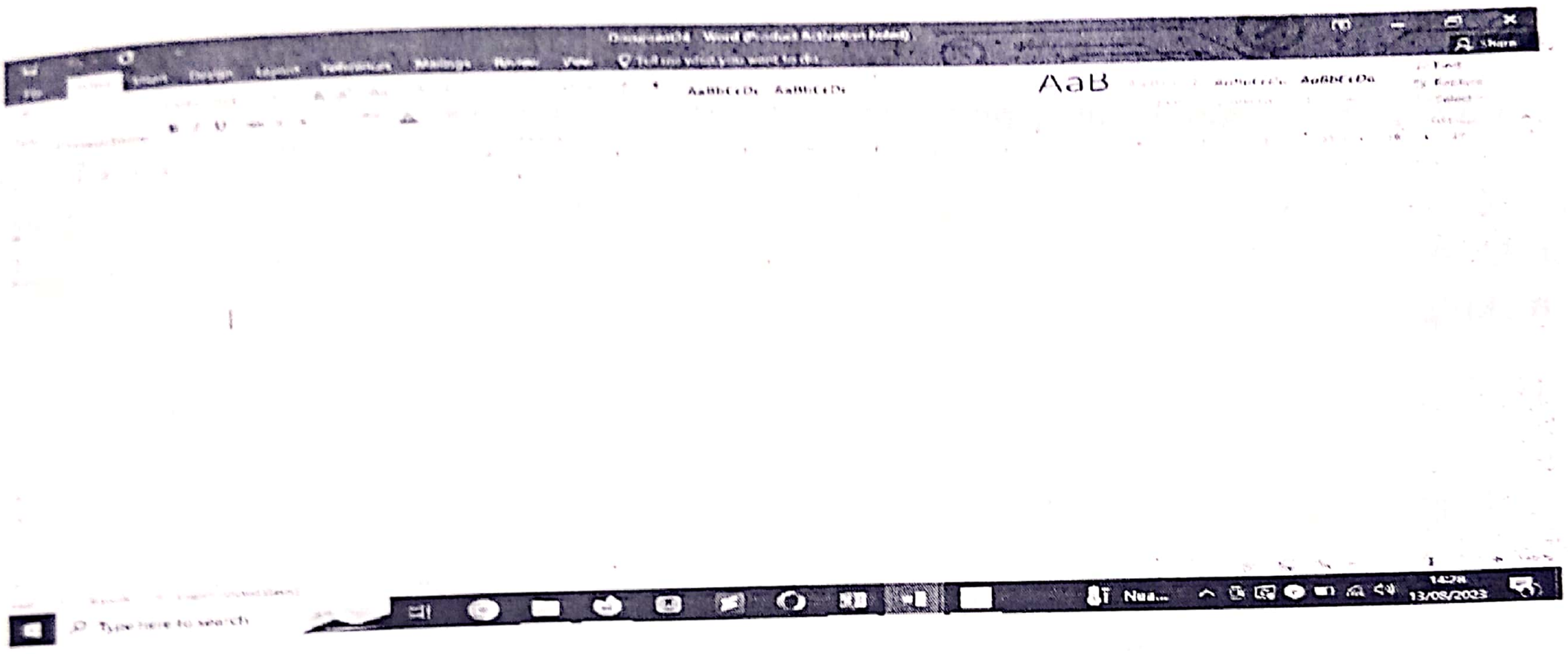
1. Off shelf packages
2. Customized programs/ Bespoke/ Tailor-made programs

1. **OFF SHELF PACKAGES**

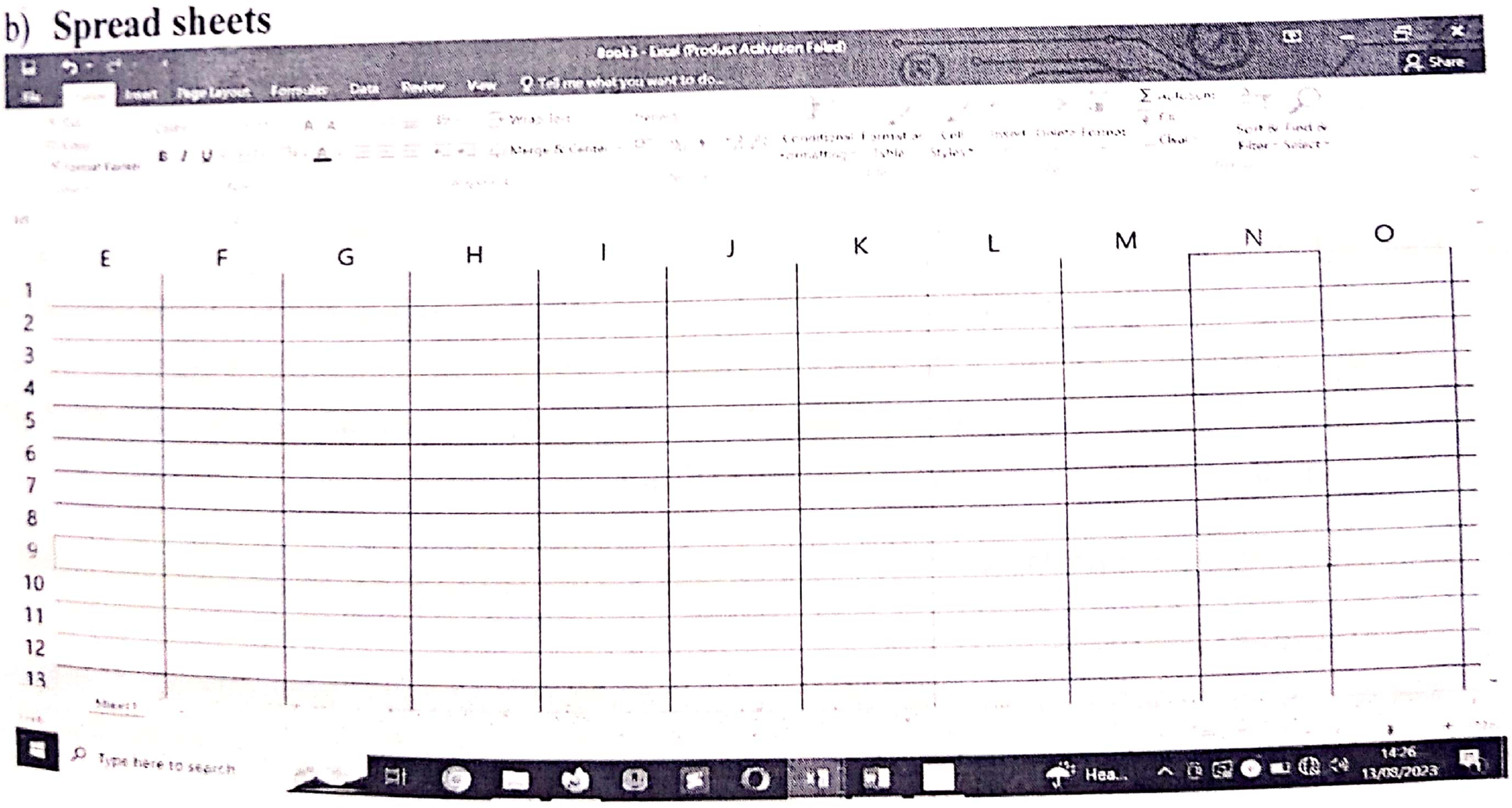
These are programs already written and ready to be run upon their purchase.

Examples include:

a) **Word processors**



b) **Spread sheets**



c) **Database management systems**
Database (DB)

It is a collection of information organized in such a way that a computer prog quickly select desired pieces of data. Application Software used to develop d includes;

- Ms Access
- SQL
- Oracle
- My SQL etc.

Database management systems

They are a collection of programs that enables you to store, modify, and information from a database. The data obtained is usually used for analysis and making.

There are many different types of DBMSs, ranging from small systems that personal computers to huge systems that run on mainframes. The following are ex of database applications:

- Computerized Library Information Systems
- Automated Teller Machines (ATMs)
- Airlines Reservation Systems
- Inventory Management System
- Customer Relationship Management System
- Supply Chain Management System

d) **Presentation software**
These are computer applications used to create professional slide shows. Slide sh usually employed during meetings, lectures, seminars to enhance presenters' Special features can be added like sound, moving text, images, and graphs. An e of presentation software is Microsoft PowerPoint.

Make a power point presentation of your CV

e) **Development Software**
These are application programs used to tailor other packages/ applications. Ex include;

- Java
- Visual basic

f) **Project Management Software**

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These are computer applications used to develop and manage projects. They enable the features like identifying the critical path, resource, time and financial management etc. Examples include;

- Microsoft Project
- Visual
- Enterprise Architect

g) **Web designing software**
These are computer applications used to develop and update websites. Examples include;

- Notepad
- Macromedia Dreamweaver

List examples of websites

h) **Desktop publishing software**
These are computer applications that enable the preparation of finer quality text and images. They enable the user to edit images by moderating the size, color and even shape or orientation. Examples are;

- Adobe Photoshop
- Adobe Page Maker
- Corel Draw
- Macromedia Fireworks

i) **Accounting software**
These are computer applications that enable entering of cash inflows and outflows, calculation of depreciation etc. They enable production of cashbooks, balance sheet, profit and loss statements and other accounting statements. Examples are;

- Pastel Accounting
- SAGE
- Tally
- QuickBooks
- Sun Systems

What are the Advantages of off shelf packages?

What are the Disadvantages of off shelf packages?

2. CUSTOMIZED/TAILOR-MADE/BESPOKE PROGRAMS

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These are tailor made program constructed to meet specific user requirements. They a specifically designed to meet user requirements. These packages are written b programmers either in house or externally by a software company.

Merits of customized programs

Discus the Demerits of customized programs

Factors to bear in mind when choosing a package

1. **It should be easy to use;** it should be user-friendly. Menu driven packages are easier to use because the menu lists options available for the user (sub menus)
2. **The cost of the package;** a firm should go for the package corresponding to the funds available. There is also need to put into consideration the maintenance costs incase of breakdown. It is thus important to carry out a costs-benefit analysis.
3. **Company needs;** the user must be convinced that the capacities and facilities of the package will handle the needs and solve problems of the company's business e.g. before purchasing one should consider the number of transactions handled by the package, also consider memory requirements.
4. **Technical requirements;** where technical knowledge is required, the person purchasing should ensure that the desired knowledge is possessed by the staff that will be using the package.
5. **After purchase service/support;** the user should know exactly how he should be helped to solve problems if they occur after purchase.
6. **Market confidence/Performance of the package;** the user should consider how long the package has been on the market and how satisfied the existing users are with that package. A good package should be effective and efficient.
7. **Legal implications;** the user must understand his/her rights to the package and all details related to issues like copy rights and restrictions of the package.
8. **Extent of documentation;** a good package should be well documented i.e. sample manuals, amount of memory, lists of hardware that can be used etc.
9. **Compatibility** of the package with existing hardware
10. **Time factor;** where a company needs a particular task to be accomplished in the shortest time possible then off-shelf packages may be recommended.
11. **Other forces;** for example, demand from customers, suppliers, employees, competitors and regulatory bodies may determine the software to purchase.
12. **Controls;** what controls are included in the package e.g. passwords, data validation checks, spelling checks, error detection etc.
13. **Up datedness;** how will the package be kept up to date? Look at the ability of the firm to have the package move with the changes in technology, in case of a fault how easy will it be to handle the fault? Can the package be modified?

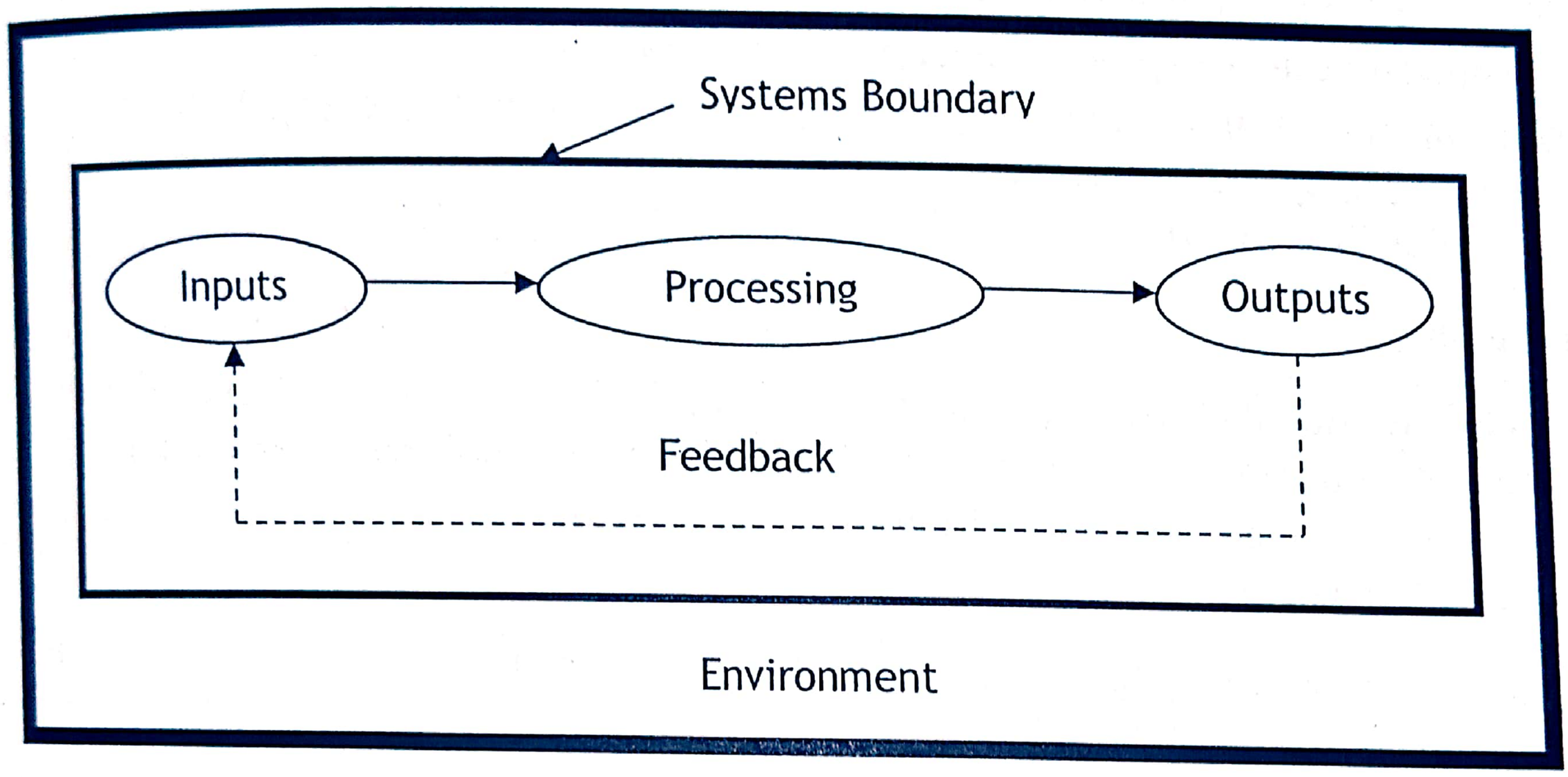
hat is a system?

ıe word system has its origin in Greek roots that means "standing together". A system can be fined in simple terms as: a set of interrelated components working together to achieve a mmon objective.

om this definition we realise that a system has some components and they are linked together some order (structure). Also a system has a purpose for its existence, which is to achieve the ıals (objectives) that are set out for it.

he Component/Parts of a System

ıere are generally five components of a system: input, output, processing, feedback and ɔundary.



From the figure, the system accepts inputs and processes them into outputs. In order to control the processing, it has a feedback component. Also it has a boundary that separates it from other systems.

Inputs; Provide the systems with what it needs to be able to operate. Input may vary from value, matter, energy or human actions to information. Human input might consist of typing an instruction booklet or starting up a piece of machinery. Inputs may be outputs from other systems. As we shall see, the output from Transactions Processing Systems is part of the input for a Management Information System.

Processes; This transforms an input into an output. Processes may involve tasks performed by humans, plants, computers, chemicals and a wide range of other actions. For example processes may consist of assembly where electronic consumer goods are being manufactured, or disassembly e.g. oil is refined.

Outputs; These are results of the processing. They could be said to represent the purpose for which the system exists. Many outputs are used as inputs to other systems. However, other outputs may also be discarded as waste, especially for defective products. Alternatively, outputs

may be discarded as waste (an input to the ecological system) or re-input to the system which has produced them, e.g. in certain circumstances, defective products.

Feedback

This is the return of the output of a system to the input as a means towards improved quality or correction of errors. In a business organisation, feedback is information produced from within the organisation (e.g. management control reports) with the purpose of helping management and other employees and triggering control decisions.

System boundary

Every system has a boundary that separates it from its environment. E.g. the cost accounting department's boundary can be expressed in terms of who works in it and what work it does. This boundary will separate it from other departments, such as financial accounts department. Systems boundaries may be natural or artificially created (an organization's department structures are artificially created).

The environment

Anything which is outside the system boundary belongs to the systems environment and not to the system itself. A system accepts inputs from the environment and provides outputs into the environment. The part of the environment from which the system receives inputs may not be the same as those which it delivers output.

The environment exerts considerable influence on the behaviour of a system. At the same time the system can do little to control the behavior of the environment.

Subsystems

Every system can be broken down into subsystems; in turn each subsystem can be broken into sub-sub systems. Separate subsystems interact with each other and respond to each other by means of communication or observation.

TYPES OF SYSTEMS

Closed System

Open System

Deterministic Systems

Probabilistic Systems/Stochastic Systems

Self-Organizing Systems/Homeostatic Systems

Computer Based Information Systems

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Computer based information systems (CBIS) are systems that rely on computer hardware and software technology to collect, process, store and distribute information. The components of computer based information systems include; Hardware, Software, Data, Procedures and Live ware.

Hardware: This includes all the supporting equipments like the input devices, processing devices, output devices, storage device and communication devices.

Software: This refers to the computer program and the manuals that support them. Computer programs are machine readable instructions that direct the circuitry within the hardware parts of the CBIS to function in a way that produces useful information from data.

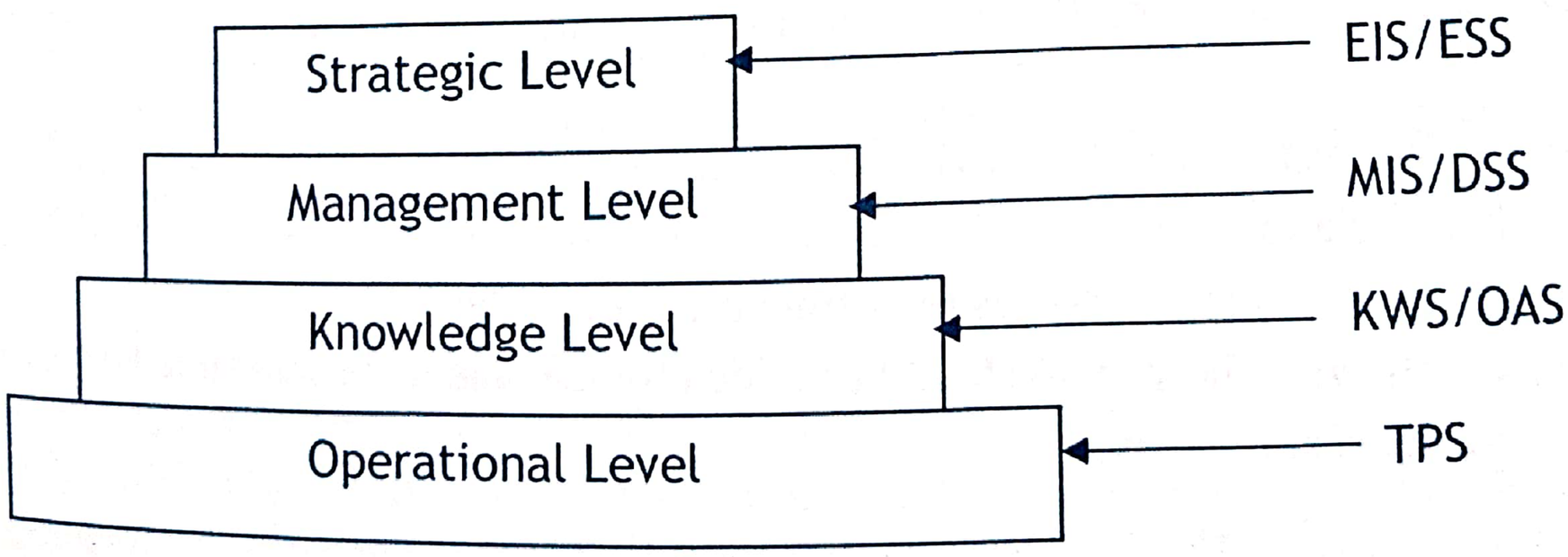
Data: Data are facts that are used by programs to produce useful information. Like programs, data are generally stored in machine readable form on disk or tape until the computer needs them.

Procedures: Procedures are the policies that govern the operation of a computer system. "Procedures are for people while software for hardware" is the common analogy that is used to illustrate the role of procedures in a CBIS.

People: Every CBIS needs people if it is to be useful. This is in most cases overlooked element and yet it is probably the component that most influences the success/failure of an information system.

Levels of Management

These levels correspond to the strategic, tactical and operational level and the knowledge level of management has been introduced over the last few years to recognize the contribution of managers who use computerized systems to expand the knowledgebase of an organization. The levels are shown diagrammatically as follows:



Note: these Management levels cut across the different functions or departments of an organization i.e. Finance, Accounting, Manufacturing and Engineering, Sales and Marketing, Human Resources and ICT Departments

Senior Managers need information to help with their business planning. Middle Managers need more detailed information to help them monitor and control business activities. Operational Managers need more detailed information to help them with the day to day running of the organisation.

1. **Strategic Level System**

The systems help senior management tackle and address strategic issues and long-term trends, both within the organisation and in the external environment. The principal concern is matching organisational capability to changes, and opportunities, occurring in the external environment in about 5 – 10 years. The type of information system at this level is ESS or EIS

Executive Support System (ESS) or Executive Information System (EIS)

It is software tailored to help senior managers make strategic decisions. It provides top management with easy access to selected information that has been processed by the organization's information system. It allows executives and managers access to information for monitoring the operations of the organization and scanning general business conditions. This is done by gathering, analyzing, and summarizing the key internal and external information used in the business.

Such systems are not designed to solve specific problems, but to tackle a changing array of problems, as they have data manipulation facilities, for example comparing budgets using trend analysis. ESS helps the managers drill into the data, present the information formats and find the information they need whenever they need it.

Characteristics of ESS

a. **Convenience:** - The system must be easy to use, convenient and fast enough to reduce time wasting through use of touch screens, mouse, Icons, menus etc.
b. **Longtime:** - The principal concern is matching organizational capability to changes, and opportunities, occurring in the external environment in about 5–10 years.
c. **Access to data:** - There should be Rapid access to data which permits drilling, evaluation and explorations.
d. **Data analysis:** - The system should provide facilities for forecasting, projections and analysis. Thus ratio trends calculations, business forecasts etc. are common. ESS is a 'what if' tool that predicts a series of performance outcomes over time using input data.
e. **Quality of presentation:** - The system should provide efficient and understandable formats using colors, graphs, diagrams and tables.

nples of ESS

Accounting system like Sun Systems - Vision reporting has a module which enhances executive level managers in decision making (Vision Alert).

- Monitoring Actual cost Vs Budget
- Stock level management
- Cash flow management
- Monitoring Debtors position

- ✓ **Inventory Monitoring systems** - like in manufacturing companies- Coca Cola has automated messages to Senior management.
  - ❖ Monitoring stock levels and expiry date
  - ❖ Monitoring Raw Materials consumption.

- ✓ **Sales & Marketing System** for Multinational companies like Nike - have ad hoc query, reporting and analysis software for up-to-date information
  - ❖ Shows which product is most popular
  - ❖ Where in the world it is selling most?

This system has the following advantages:

i. It can be able to account how it has arrived at a given decision.
ii. They can solve problems in a given domain well or better than human decision makers.
iii. They are not emotional in their decision making.

2. Management Level System

The system is designed to serve the monitoring, controlling, decision-making, and administrative activities of middle managers. These typically provide periodic reports rather than instant information on operations. Some of these systems support non-routine decision-making, focusing on less-structured decisions for which information requirements are not always clear. This will often require information from within the organisation, as well as from normal operational-level data. Examples are MIS and DSS.

Management Information System (MIS)

MIS take the information generated by Transaction Processing Systems (TPS) and convert it into aggregated forms meaningful to managers. It is normally concerned with internal sources of information. It normally takes data from the TPS and summarizes it into a series of management reports. These reports tend to be used by the middle management and operational supervisor.

These system types reflect the overall approach of the MIS to summarizing information for various TPSs within the organization and presenting that information in a useable summary form to management. For example, capital investment analysis using Microsoft excel.

Characteristics of Management Information Systems

i. MIS support structured decisions at the operational and management control levels

iii. MIS rely on existing corporate data-and data flows.
iv. MIS have little analytical capability.
v. MIS generally aid in decision making using past and present data.
vi. MIS are relatively inflexible.

Outputs of MIS

- **Scheduled reports** are produced periodically or on a schedule, such as daily, weekly, or monthly (i.e., a monthly summary report that list total payroll costs). *A key indicator report* is a type of scheduled report that summarizes the previous day's critical activities (e.g. sales volume).
- **Demand reports** are produced to give certain information at a manager's request (i.e., an inventory report for a particular item).
- **Exception reports** are reports that are automatically produced when a situation is unusual or requires management action (i.e., a report for all customers that are late in their payments.
- **Drill Down Reports** are reports that provide detailed data about a situation

Decision Support Systems (DSS)

The DSS helps decision-makers confront semi-structured problems through direct interaction with data and analysis models. It's specifically designed to help management make decisions in situations where there is uncertainty about the possible outcomes of those decisions.

Examples/applications

- Database Management
- Marketing
- Accounting
- Risk analysis etc.

The main difference between MIS and DSS are given as under:

	MIS	DSS
1	Supports decisions by management	Provides technical decisions
2	Assists in making structured decisions for tactical planning and control	Assists in semi-structured decision.
3	Indirect support designed for managers.	Direct support tailored for decision making style

Periodic exception and demand reports.	Interactive inquiries and responses
Format is pre-specified than is fixed	Format is flexible and adaptable
Information is produced by mathematical and statistical analysis of data	Information is produced by analytical modeling
Uses hardware and software and database	Uses hardware and model bases.
Controlled by information systems specialists	Controlled by end users

. Knowledge Level System

Knowledge systems are required to support the knowledge workers (engineers, lawyers, doctors etc) and data workers (secretaries, book keepers etc) within an organization. The aim of these systems is to help the organization introduce new knowledge into the organization as well as organize and provide access to the existing knowledge. Examples are OAS and KWS.

Knowledge Work Systems (KWS)

Information systems that aid knowledge workers in the creation and integration of new knowledge in the organization. Knowledge work systems (KWS) serve the information needs at the knowledge level of the organization.

Examples/applications:

- Engineering workstations
- Investment workstations
- Computer Aided Design (CAD) - product design using computer graphics.
- Virtual Reality - Interactive software that creates photorealistic simulations of real world objects (Virtual Reality Modeling Language: VRML)

Office Automation Systems (OAS)

Office systems are information technology applications designed to increase data workers' productivity by supporting the coordinating and communicating activities of the typical office.

These are systems that serve the data workers at the knowledge level in an organization (these tend to process rather than create information). They consist primarily of secretaries, bookkeepers, filing clerks, or managers whose jobs are principally to use, manipulate, or disseminate information.

Examples/applications

- Management of documents - word processing, desktop publishing, document imaging, and digital filing, spreadsheets.

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- Scheduling - electronic calendars
- Communication - Electronic Mail, voice mail, IPhone, groupware or videoconferencing.

4. Operational Level System

Support operational managers by keeping track of the elementary activities and transactions of the organisation. The principle purpose of systems at this level is to answer routine questions and track the flow of transactions through the organisation. Covers things such as sales, receipts, cash deposits, payroll, credit decisions etc. An example is the TPS.

Transaction Processing Systems

This is a computerized package designed to record the basic transaction data within an organization. It records all of the daily routine transactions that take place within an organization, and is used primarily by clerks and operations staff that either input or maintains the data on the system.

Characteristics of TPS

- They are the source of data for other information systems.
- They interact directly with the business environment like the customers and suppliers; therefore, its failure is easily noticed.
- They are oriented towards the operational level of management.
- TPS collect data continuously, frequently on a daily basis.
- Data captured by TPS is used to monitor performance of the organisation; therefore, TPS must be reliable, accurate and secure.
- Require large storage capacity as well as high processing speed.
- Constant change - Transactions occur in large numbers, and their changes are largely uncontrolled and unpredictable, within the limits of the system.

Examples/Applications

- Airline reservation systems
- Automated Teller Machines
- Electronic Point of Sale
- Supply Chain Management System etc.

Expert Systems

This is a computerized package designed to allow non-expert users to make expert decisions. They are computer programs that are derived from a branch of computer science research called Artificial Intelligence (AI). These systems are used by all levels of the organisation.

Such programs are important in that: -

- They preserve knowledge of experts that can be lost through death or retirement.
- Put information in active form to be summarized immediately.
- Assists juniors to think like professionals.

- Saves time associated with training or employment of experts.

Characteristics:

- Solves problems as well as or even better than human experts
- Uses artificial intelligence in form of rules.

Examples/Applications

- Robotics
- Virtual Medical Diagnosis

Human resource management systems

These are Systems that help the firm to manage its resources efficiently. This includes the management of personnel records such as: payroll, academic details, employee benefits, performance, and any other personnel information.

Major application systems:

- HRM Information Systems (HRMIS)

Human Resource Management Information System

A Marketing Information System (MKIS) is an information system that is commonly used by marketing management to analyse and view information pertaining to marketing activities. As the name suggests, an MKIS is a computer-based information system therefore used to input, store, process and output marketing information. An MKIS spans four subset components, which are given below:

1. Marketing Intelligence System

This sub-system stores information gathered from a firm's marketing intelligence activities. Marketing intelligence consists of actions a firm would undertake within its own market or industry, geared towards information existing within its markets. This can be obtained via communication with suppliers, consumers or other bodies within a market.

Whereas marketing research is focused, market intelligence is not. A marketing intelligence system is a set of procedures and data sources used by marketing managers to sift information from the environment that they can use in their decision making. This scanning of the economic and business environment can be undertaken in a variety of ways, including;

Unfocused scanning The manager, by virtue of what he/she reads, hears and watches exposes him/herself to information that may prove useful. The behaviour is unfocused and

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These are computer applications used to develop and manage projects. They enable the features like identifying the critical path, resource, time and financial management etc. Examples include:

- Microsoft Project
- Visual
- Enterprise Architect

g) **Web designing software**
These are computer applications used to develop and update websites. Examples include;

- Notepad
- Macromedia Dreamweaver

List examples of websites

h) **Desktop publishing software**
These are computer applications that enable the preparation of finer quality text and images. They enable the user to edit images by moderating the size, color and even shape or orientation. Examples are;

- Adobe Photoshop
- Adobe Page Maker
- Corel Draw
- Macromedia Fireworks

i) **Accounting software**
These are computer applications that enable entering of cash inflows and outflows, calculation of depreciation etc. They enable production of cashbooks, balance sheet, profit and loss statements and other accounting statements. Examples are;

- Pastel Accounting
- SAGE
- Tally
- QuickBooks
- Sun Systems

What are the Advantages of off shelf packages?

What are the Disadvantages of off shelf packages?

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These are tailor made program constructed to meet specific user requirements. It specifically designed to meet user requirements. These packages are written programmers either in house or externally by a software company.

Merits of customized programs

Discus the Demerits of customized programs

Factors to bear in mind when choosing a package

1. **It should be easy to use;** it should be user-friendly. Menu driven packages are easy to use because the menu lists options available for the user (sub menus)
2. **The cost of the package;** a firm should go for the package corresponding to the funds available. There is also need to put into consideration the maintenance costs including breakdown. It is thus important to carry out a costs-benefit analysis.
3. **Company needs;** the user must be convinced that the capacities and facilities of the package will handle the needs and solve problems of the company's business e.g. when purchasing one should consider the number of transactions handled by the package, consider memory requirements.
4. **Technical requirements;** where technical knowledge is required, the person purchasing should ensure that the desired knowledge is possessed by the staff that will be using the package.
5. **After purchase service/support;** the user should know exactly how he should be helped to solve problems if they occur after purchase.
6. **Market confidence/Performance of the package;** the user should consider how the package has been on the market and how satisfied the existing users are with the package. A good package should be effective and efficient.
7. **Legal implications;** the user must understand his/her rights to the package and details related to issues like copy rights and restrictions of the package.
8. **Extent of documentation;** a good package should be well documented i.e. user manuals, amount of memory, lists of hardware that can be used etc.
9. **Compatibility** of the package with existing hardware
10. **Time factor;** where a company needs a particular task to be accomplished in shortest time possible then off-shelf packages may be recommended.
11. **Other forces;** for example, demand from customers, suppliers, employees, competitors and regulatory bodies may determine the software to purchase.
12. **Controls;** what controls are included in the package e.g. passwords, data validation checks, spelling checks, error detection etc.
13. **Up datedness;** how will the package be kept up to date? Look at the ability of the package to have the package move with the changes in technology, in case of a fault how will it be to handle the fault? Can the package be modified?

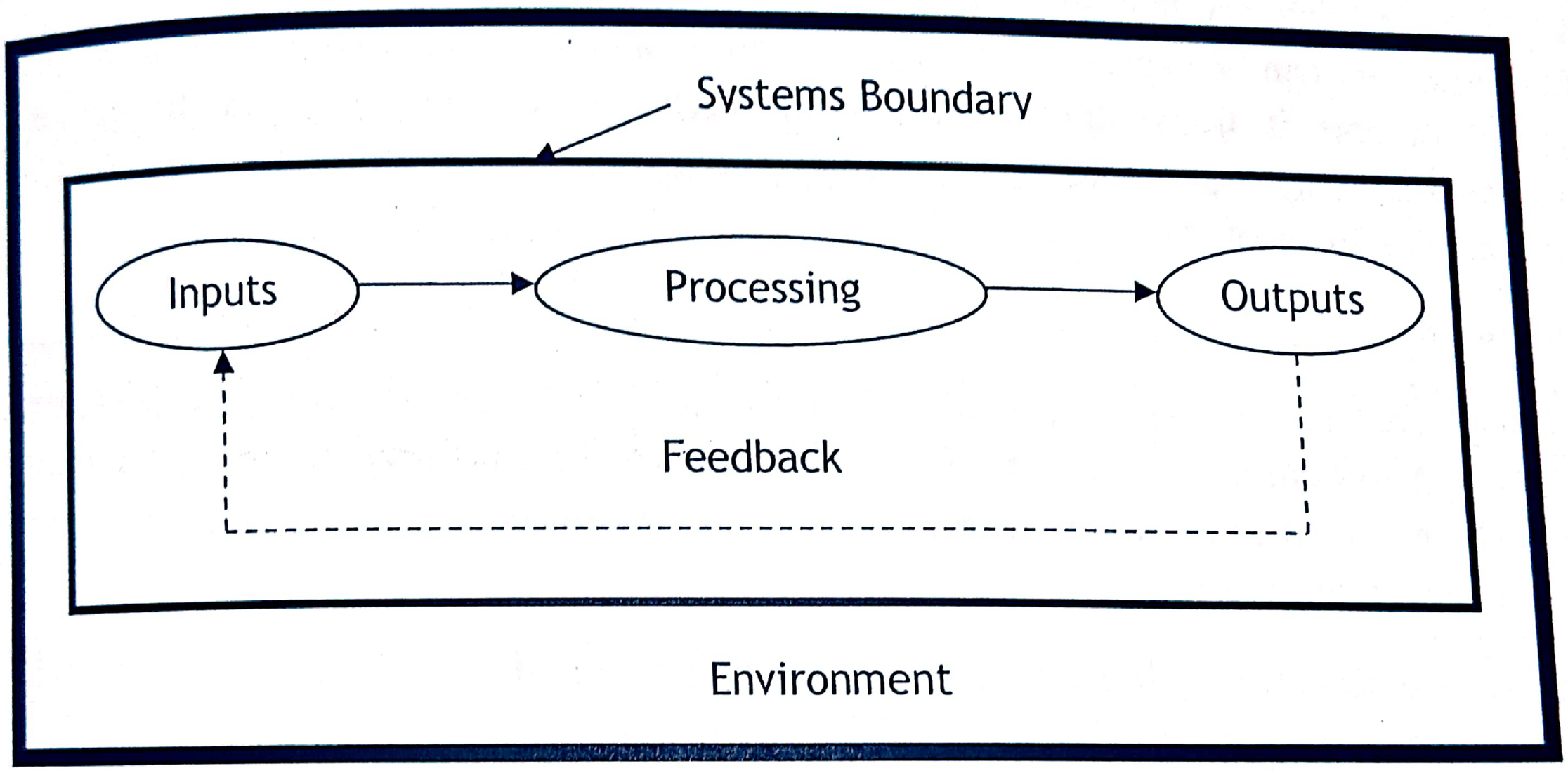
What is a system?

The word system has its origin in Greek roots that means "standing together". A system can be defined in simple terms as: a set of interrelated components working together to achieve a common objective.

From this definition we realise that a system has some components and they are linked together in some order (structure). Also a system has a purpose for its existence, which is to achieve the goals (objectives) that are set out for it.

The Component/Parts of a System

There are generally five components of a system: input, output, processing, feedback and boundary.



From the figure, the system accepts inputs and processes them into outputs. In order to control the processing, it has a feedback component. Also it has a boundary that separates it from other systems.

Inputs; Provide the systems with what it needs to be able to operate. Input may vary from value, matter, energy or human actions to information. Human input might consist of typing an instruction booklet or starting up a piece of machinery. Inputs may be outputs from other systems. As we shall see, the output from Transactions Processing Systems is part of the input for a Management Information System.

Processes; This transforms an input into an output. Processes may involve tasks performed by humans, plants, computers, chemicals and a wide range of other actions. For example processes may consist of assembly where electronic consumer goods are being manufactured, or disassembly e.g. oil is refined.

Outputs; These are results of the processing. They could be said to represent the purpose for which the system exists. M[illegible] inputs to other systems. However, oth[illegible]

may be discarded as waste (an input to the ecological system) or re-input to the system which produced them, e.g. in certain circumstances, defective products.

Feedback

This is the return of the output of a system to the input as a means towards improved quality or correction of errors. In a business organisation, feedback is information produced from within the organisation (e.g. management control reports) with the purpose of helping management and other employees and triggering control decisions.

System boundary

Every system has a boundary that separates it from its environment. E.g. the cost accounting department's boundary can be expressed in terms of who works in it and what work it does. This boundary will separate it from other departments, such as financial accounts department. Systems boundaries may be natural or artificially created (an organization's department structures are artificially created).

The environment

Anything which is outside the system boundary belongs to the systems environment and not to the system itself. A system accepts inputs from the environment and provides outputs into the environment. The part of the environment from which the system receives inputs may not be the same as those which it delivers output.

The environment exerts considerable influence on the behaviour of a system. At the same time the system can do little to control the behavior of the environment.

Subsystems

Every system can be broken down into subsystems; in turn each subsystem can be broken into sub-sub systems. Separate subsystems interact with each other and respond to each other by means of communication or observation.

TYPES OF SYSTEMS

Closed System

Open System

Deterministic Systems

Probabilistic Systems/Stochastic Systems

Self-Organizing Systems/Homeostatic Systems

Computer Based Information Systems

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mputer based information systems (CBIS) are systems that rely on computer hardware and tware technology to collect, process, store and distribute information. The components of nputer based information systems include; Hardware, Software, Data, Procedures and Live re.

rdware: This includes all the supporting equipments like the input devices, processing ices, output devices, storage device and communication devices.

tware: This refers to the computer program and the manuals that support them. Computer grams are machine readable instructions that direct the circuitry within the hardware parts of CBIS to function in a way that produces useful information from data.

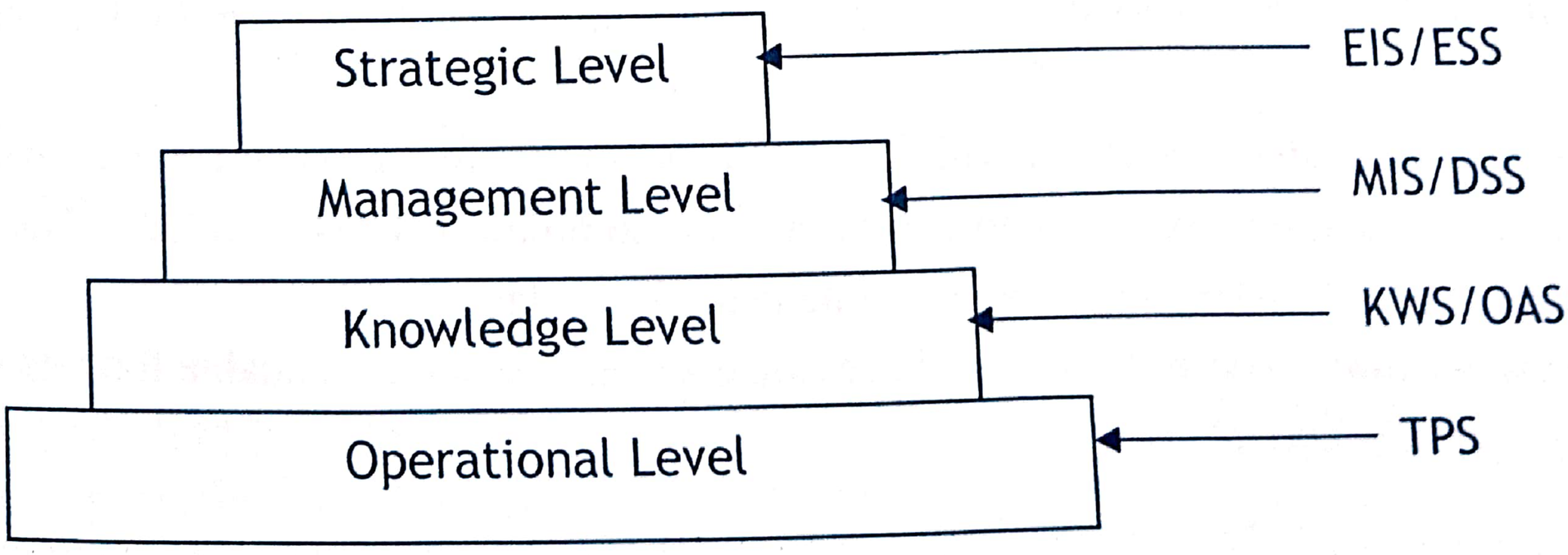
ta: Data are facts that are used by programs to produce useful information. Like programs, a are generally stored in machine readable form on disk or tape until the computer needs m.

ocedures: Procedures are the policies that govern the operation of a computer system. ocedures are for people while software for hardware" is the common analogy that is used to strate the role of procedures in a CBIS.

ple: Every CBIS needs people if it is to be useful. This is in most cases overlooked element yet it is probably the component that most influences the success/failure of an information tem.

vels of Management

ese levels correspond to the strategic, tactical and operational level and the knowledge level of nagement has been introduced over the last few years to recognize the contribution of nagers who use computerized systems to expand the knowledgebase of an organization. The els are shown diagrammatically as follows:



Note: these Management levels cut across the different functions or departments of an

Senior Managers need information to help with their business planning. Middle Managers need more detailed information to help them monitor and control business activities. Operational Managers need more detailed information to help them with the day to day running of the organisation.

1. Strategic Level System

The systems help senior management tackle and address strategic issues and long-term trends both within the organisation and in the external environment. The principal concern is matching organisational capability to changes, and opportunities, occurring in the external environment in about 5 – 10 years. The type of information system at this level is ESS or EIS

Executive Support System (ESS) or Executive Information System (EIS)

It is software tailored to help senior managers make strategic decisions. It provides management with easy access to selected information that has been processed by the organization's information system. It allows executives and managers access to information, monitoring the operations of the organization and scanning general business conditions. This is done by gathering, analyzing, and summarizing the key internal and external information used in the business.

Such systems are not designed to solve specific problems, but to tackle a changing array of problems, as they have data manipulation facilities, for example comparing budgets using trend analysis. ESS helps the managers drill into the data, present the information formats and find the information they need whenever they need it.

Characteristics of ESS

a. **Convenience:** - The system must be easy to use, convenient and fast enough to reduce time wasting through use of touch screens, mouse, Icons, menus etc.
b. **Longtime:** - The principal concern is matching organizational capability to changes, and opportunities, occurring in the external environment in about 5–10 years.
c. **Access to data:** - There should be Rapid access to data which permits drilling, evaluations and explorations.
d. **Data analysis:** - The system should provide facilities for forecasting, projections and analysis. Thus ratio trends calculations, business forecasts etc. are common. ESS is a 'what if' tool that predicts a series of performance outcomes over time using input data.
e. **Quality of presentation:** - The system should provide efficient and understandable formats using colors, graphs, diagrams and tables.

Examples of ESS

✓ **Accounting system** like Sun Systems - Vision reporting has a module which enhances executive level managers in decision making (Vision Alert).
- ❖ Monitoring Actual cost Vs Budget
- ❖ Stock level management
- ❖ Cash flow management
- ❖ Monitoring Debtors position

✓ **Inventory Monitoring systems** - like in manufacturing companies- Coca Cola has automated messages to Senior management.

- Monitoring stock levels and expiry date
- Monitoring Raw Materials consumption.

✓ **Sales & Marketing System** for Multinational companies like Nike - have ad hoc query, reporting and analysis software for up-to-date information

- Shows which product is most popular
- Where in the world it is selling most?

This system has the following advantages:

i. It can be able to account how it has arrived at a given decision.
ii. They can solve problems in a given domain well or better than human decision makers.
iii. They are not emotional in their decision making.

2. Management Level System

The system is designed to serve the monitoring, controlling, decision-making, and administrative activities of middle managers. These typically provide periodic reports rather than instant information on operations. Some of these systems support non-routine decision-making, focusing on less-structured decisions for which information requirements are not always clear. This will often require information from within the organisation, as well as from normal operational-level data. Examples are MIS and DSS.

Management Information System (MIS)

MIS take the information generated by Transaction Processing Systems (TPS) and convert it into aggregated forms meaningful to managers. It is normally concerned with internal sources of information. It normally takes data from the TPS and summarizes it into a series of management reports. These reports tend to be used by the middle management and operational supervisor.

These system types reflect the overall approach of the MIS to summarizing information for various TPSs within the organization and presenting that information in a useable summary form to management. For example, capital investment analysis using Microsoft excel.

Characteristics of Management Information Systems

i. MIS support structured decisions at the operational and management control levels. However, they are also useful for planning purposes of senior management staff.
ii. MIS are generally reporting and control oriented. They are designed to report on existing operations and therefore to help provide day-to-day control of operations.

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iii. MIS rely on existing corporate data-and data flows.
iv. MIS have little analytical capability.
v. MIS generally aid in decision making using past and present data.
vi. MIS are relatively inflexible.

Outputs of MIS

- **Scheduled reports** are produced periodically or on a schedule, such as daily, weekly, or monthly (i.e., a monthly summary report that list total payroll costs). *A key indicator report* is a type of scheduled report that summarizes the previous day's critical activities (e.g. sales volume).
- **Demand reports** are produced to give certain information at a manager's request (i.e., an inventory report for a particular item).
- **Exception reports** are reports that are automatically produced when a situation is unusual or requires management action (i.e., a report for all customers that are late in their payments.
- **Drill Down Reports** are reports that provide detailed data about a situation

Decision Support Systems (DSS)

The DSS helps decision-makers confront semi-structured problems through direct interaction with data and analysis models. It's specifically designed to help management make decisions in situations where there is uncertainty about the possible outcomes of those decisions.

Examples/applications

- Database Management
- Marketing
- Accounting
- Risk analysis etc.

The main difference between MIS and DSS are given as under:

	MIS	DSS
1	Supports decisions by management	Provides technical decisions
2	Assists in making structured decisions for tactical planning and control	Assists in semi-structured decision.
3	Indirect support designed for managers.	Direct support tailored for decision making style

4	Periodic exception and demand reports.	Interactive inquiries and responses
5	Format is pre-specified than is fixed	Format is flexible and adaptable
6	Information is produced by mathematical and statistical analysis of data	Information is produced by analytical modeling
7	Uses hardware and software and database	Uses hardware and model bases.
8	Controlled by information systems specialists	Controlled by end users

3. Knowledge Level System

Knowledge systems are required to support the knowledge workers (engineers, lawyers, doctors etc) and data workers (secretaries, book keepers etc) within an organization. The aim of these systems is to help the organization introduce new knowledge into the organization as well as organize and provide access to the existing knowledge. Examples are OAS and KWS.

Knowledge Work Systems (KWS)

Information systems that aid knowledge workers in the creation and integration of new knowledge in the organization. Knowledge work systems (KWS) serve the information needs at the knowledge level of the organization.

Examples/applications:

- Engineering workstations
- Investment workstations
- Computer Aided Design (CAD) - product design using computer graphics.
- Virtual Reality - Interactive software that creates photorealistic simulations of real world objects (Virtual Reality Modeling Language: VRML)

Office Automation Systems (OAS)

Office systems are information technology applications designed to increase data workers' productivity by supporting the coordinating and communicating activities of the typical office.

These are systems that serve the data workers at the knowledge level in an organization (these tend to process rather than create information). They consist primarily of secretaries, bookkeepers, filing clerks, or managers whose jobs are principally to use, manipulate, or disseminate information.

Examples/applications

- Management of documents - word processing, desktop publishing, document imaging, and digital filing

- Scheduling - electronic calendars
- Communication - Electronic Mail, voice mail, IPhone, groupware or videoconferencing.

4. Operational Level System

Support operational managers by keeping track of the elementary activities and transactions of the organisation. The principle purpose of systems at this level is to answer routine questions and track the flow of transactions through the organisation. Covers things such as sales, receipts, cash deposits, payroll, credit decisions etc. An example is the TPS.

Transaction Processing Systems

This is a computerized package designed to record the basic transaction data within an organization. It records all of the daily routine transactions that take place within an organization and is used primarily by clerks and operations staff that either input or maintains the data on the system.

Characteristics of TPS

- They are the source of data for other information systems.
- They interact directly with the business environment like the customers and suppliers therefore, its failure is easily noticed.
- They are oriented towards the operational level of management.
- TPS collect data continuously, frequently on a daily basis.
- Data captured by TPS is used to monitor performance of the organisation; therefore, TPS must be reliable, accurate and secure.
- Require large storage capacity as well as high processing speed.
- Constant change - Transactions occur in large numbers, and their changes are largely uncontrolled and unpredictable, within the limits of the system.

Examples/Applications

- Airline reservation systems
- Automated Teller Machines
- Electronic Point of Sale
- Supply Chain Management System etc.

Expert Systems

This is a computerized package designed to allow non-expert users to make expert decisions. They are computer programs that are derived from a branch of computer science research called Artificial Intelligence (AI). These systems are used by all levels of the organisation.

Such programs are important in that: -

- They preserve knowledge of experts that can be lost through death or retirement.
- Put information in active form to be summarized immediately.
- Assists juniors to think like professionals.

- Saves time associated with training or employment of experts.

Characteristics:

- Solves problems as well as or even better than human experts
- Uses artificial intelligence in form of rules.

Examples/Applications

- Robotics
- Virtual Medical Diagnosis

Human resource management systems

These are Systems that help the firm to manage its resources efficiently. This includes the management of personnel records such as: payroll, academic details, employee benefits, performance, and any other personnel information.

Major application systems:

- HRM Information Systems (HRMIS)

Human Resource Management Information System

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Unfocused scanning	The manager, by virtue of what he/she reads, hears and watches exposes him/herself to information that may prove useful. The behaviour is unfocused and the manager has no specific purpose in mind.
Semi-	Again, the manager is not in search of particular pieces of information that he/she

focused scanning	is actively searching but does narrow the range of media that is scanned instance, the manager may focus more on economic and business publica broadcasts etc. and pay less attention to political, scientific or technological re
Informal search	This describes the situation where a fairly limited and unstructured attempt is m to obtain information for a specific purpose. For example, the marketing mana of a firm considering entering the business of importing frozen fish fro neighbouring country may make informal inquiries as to prices and demand le of frozen and fresh fish. There would be little structure to this search with manager making inquiries with traders he/she happens to encounter as well as other *ad hoc* contacts in ministries, international aid agencies, with t associations, importers/exporters etc.
Formal search	This is a purposeful search after information in some systematic way. information will be required to address a specific issue. This sort of activity seem to share the characteristics of marketing research it is carried out by manager him/herself rather than a professional resear

2. Internal Processes System

The internal processes system catalogues all internal marketing processes within a firm.

- All enterprises which have been in operation for any period of time have a wealt information. However, this information often remains under-utilized because i compartmentalized, either in the form of an individual entrepreneur or in the functi departments of larger businesses.
- The internal records that are of immediate value to marketing decisions are: or received, stockholdings and sales invoices. These are some of the internal records can be used by marketing managers, but even this small set of records is capabl generating a great deal of information.
- By comparing orders received with invoices an enterprise can establish the exte which it is providing an acceptable level of customer service. In the same comparing stockholding records with orders received helps an enterprise asce whether its stocks are in line with current demand patterns.

3. Marketing Research System

- This section of the overall system contains data from a firm's marketing rese activities.
- Marketing research is a proactive search for information. That is, the enterprise w commissions these studies does so to solve a perceived marketing problem. In cases, data is collected in a purposeful way to address a well-defined problem problem which can be defined and solved within the course of the study).
- The other form of marketing research does not center on a specific marketing pro but is an attempt to continuously monitor the marketing environment. These monito or tracking exercises are continuous marketing research studies, often involving pane

manufacturers, consumers or distributors from which the same data is collected at regular intervals.

Analytical System

The analytical system is the only sub-system which does not store data or information. Its function is to analyse and process data from the other three systems, into reliable, timely and relevant information for the perusal and use of marketing management.

Customer Relationship Management (CRM)

CRM is a broadly recognized and widely-implemented strategy for managing a company's interactions with customers, clients and sales prospects. It involves using technology to organize, automate, and synchronize business processes especially sales activities, but also handles marketing, customer service, and technical support. The overall goals are to find, attract, and win new clients, nurture and retain those the company already has, entice former clients back and reduce the costs of marketing and client service. Customer relationship management is a name for a company-wide business strategy including all customer-interface departments and even beyond.

CRM activities are mainly of two different types.

- Reactive service is where the customer has a problem and contacts the company.
- Proactive service is where the manager has decided not to wait for the customer to contact the firm, but to be aggressive a contact the customer himself in order to establish a dialogue and solve problems.

Factors for Implementing CRM Effectively

Several CRM software packages exist that can help companies in deploying CRM activities. Besides choosing one of these packages, companies can also choose to design and build their own solutions. In order to implement CRM in an effective way, one needs to consider the following factors:

- Create a customer-based culture in the organization.
- Adopt customer-based managers to assess satisfaction.
- Develop an end-to-end process to serve customers.
- Recommend questions to be asked to help a customer solve a problem.
- Track all aspects of selling to customers, as well as prospects.

CRM solutions are more effective once they are being implemented in other information systems used by the company. Examples are Transaction Processing System (TPS) to process data real-time, which can then be sent to the sales and finance departments in order to recalculate inventory and

Designing, creating and implementing IT projects has always been risky. Not only because of the amount of money that is involved, but also because of the high chances of failure. Some of the major issues relating to CRM failure are the following:

- Difficulty in measuring and valuing intangible benefits.
- Failure to identify and focus on specific business problems.
- Lack of active senior management sponsorship.
- Poor user acceptance.
- Trying to automate a poorly defined process.

eCRM

Electronic CRM concerns all forms of managing relationships with customers making use of Information Technology (IT). These are the activities to manage customer relationships by using the Internet, web browsers or other electronic touch points.

The challenge here is to offer communication and information on the right topic, in the right amount, and at the right time that fits the customer's specific needs. Channels, through which companies can communicate with its customers, are growing day by day, and as a result, getting their time and attention has turned into a major challenge.

One of the reasons eCRM is so popular nowadays is that digital channels can create unique and positive experiences – not just transactions – for customers.

In a world where almost every company is connected to the Internet, eCRM has become a requirement for survival, not just a competitive advantage.

Examples of Tools Used in eCRM

- Personalized Web Pages where customers are recognized and their preferences are shown.
- Customized products or services

Different levels of eCRM

In defining the scope of eCRM, three different levels can be distinguished:

- **Foundational services**: This includes the minimum necessary services such as web site effectiveness and responsiveness as well as order fulfillment.
- **Customer-centered services**: These services include order tracking, product configuration and customization as well as security/trust.
- **Value-added services**: These are extra services such as online auctions and online training and education.

The Role of Computer Based Information Systems

1. They are used to provide management information. E.g. report on sales, total amount owed to suppliers or owed by debtors. TPS
2. Enable managers at all levels to make timely and effective decisions for planning, directing and controlling activities for which they are responsible.
3. Allow executives and managers access to information for monitoring the operations of the organisation and scanning general business conditions. This is done by gathering, analyzing and summarizing the key internal and external information used in business.
4. They help in evaluation of organisation performance.
5. Improve on productivity of data workers by providing access to basic systems such as email and word processing.
6. Help the business create and share information and also integrate new knowledge into the organisation.
7. There is proper coordination among departments in the organisation.
8. Expert systems allow non-expert users to make expert decisions. The expert system stores the knowledge and experience of a number of experts in a structured database known as a knowledge base.
9. Competitive advantage – CBIS provide the foundation for decision making at all levels. They are unique to different organizations as well as to the different levels in a particular organization. The decisions can lead to improvement of trade.
10. Responsiveness to the changes in the environment – CBIS can be updated to suite the changes in technology and the changes in the organization's environment. For instance, for an organization to stay ahead of competition, its information system can be designed to provide adequate external information like the market share.
11. Reduction in costs – CBIS can help the organization to reduce its cost and thus become the most cost effective organization as well as maintaining a high reputation for its customers.
12. Realistic budgets can be set with more detailed information which can lead to minimizing of wastages.
13. Differentiation of services – different CBIS can provide different services to the staff as well as to the clients of the organization. They make the organization's services more attractive and unique.
14. Modern working environment – the staff of the organization are motivated by the use of modern information systems to perform their duties.
15. CBIS have a high speed of operation, this increases the productivity of the employees in the organization.
16. CBIS handle huge amounts of data. They enable the organization keep track of its records. They are able to store, process and retrieve high quality and reliable information.

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MANAGEMENT OF IT FACILITIES

General requirements for setting computer systems
Computer security
Computer ethics

COMPUTER ETHICS

When computers first began to be used in society at large, the absence of ethical standards
their use and related issues caused some problems.

However, as their use became widespread in every facet of our lives, discussions in co
ethics resulted in some kind of a consensus. Today, many of these rules have been formula
laws, either national or international.

Computer Ethics refers to the rules that govern computer usage

THE TEN COMMANDMENTS OF COMPUTER ETHICS (COMPUTER ETH INSTITUTE)

1. **Thou shalt not use a computer to harm other people:** If it is unethical to write a progra handles the timing of the bomb. It is equally bad to access and destroy their files.
2. **Thou shalt not interfere with other people's computer work:** Computer viruses are programs that disrupt computer work by destroying files, using up computer time or memo by displaying annoying messages. Generating and consciously spreading computer virus unethical.
3. **Thou shalt not snoop around in other people's files:** Obtaining other people's non-public or reading other people's e-mail messages is as bad as opening and reading their letters: T invading their privacy.
4. **Thou shalt not use a computer to steal:** It is illegal to use a computer to break into the acc of a company or a bank and transferring money should be judged the same way as robbery.
5. **Thou shalt not use a computer to bear false witness:** The Internet can spread untruth as it can spread truth. Putting out false "information" to the world is bad. For instance, spre false rumors about a person or false propaganda about historical events is wrong.
6. **Thou shalt not use or copy software for which you have not paid:** Software is an intell product. Obtaining illegal copies of copyrighted software is as bad as photocopying a copyri book.
7. **Thou shalt not use other people's computer resources without authorization:** Hack system to break and bypass the authorization is unethical.
8. **Thou shalt not appropriate other people's intellectual output:** Copying somebody's program without proper authorization is **software piracy** and is unethical.
9. **Intellectual property** is a form of ownership, and may be protected by copyright laws.
10. **Thou shalt think about the social consequences of the program you write:** You have to about computer issues in a more general social framework.
11. **Thou shalt use a computer in ways that show consideration and respect:** e.g. avoid rude to others

COMPUTER CRIME

Refers to the "misuse" of computers and peripherals in a way that can cause destruction or breakdown of the hardware and or software.

There are mainly three computer crimes and they include;

Software Piracy

Refers to the illegal duplication of copyrighted software. Most software companies have given in to user demands and removed physical copy protection from their products, making copying easy. This piracy may include downloading music and videos illegally.

Hacking and Electronic Trespassing

This is the act of entering corporate and government computers using stolen passwords and security loopholes and stealing information, transferring money to other accounts etc. The people who are involved in this act are called Hackers. Some Hackers use logic bombs, viruses to shut down or cripple the system and change passwords.

Software/hardware sabotage

Involves using software for destructive activities like viruses, worms, Trojan horses to destroy the computer hardware and software. These are maliciously developed by some programmers with the intentions of spreading them to computers.

Computer Abuse

This implies wrongful use of computers and peripherals. Computer abuse may not necessarily lead to a breakdown of the computer system. There are various types of computer abuse, i.e.

Moonlighting; using the company's computer facilities to do other personal work especially after the office hours.

Surfing during company time; this is using the company Internet facilities to surf and send personal emails during the company time.

Playing games; using the computer facilities during the company hours to play games such as Pachisi, Solitaire, Free cell etc.

Wrongful shutting down of computers; this is whereby a computer user turns off the computer without shutting it down.

Leaving the computer on for long hours; this is especially when the computer is not in use, for example leaving the computer on overnight.

Hitting the computer; whereby a lot of force is used on the computer, for example on the keyboard. This can also include intentional hitting of the computer.

Spreading viruses; transferring viruses from one computer to other using storage devices like memory sticks and floppy disks.

Downloading infected files; downloading file attachments that are infected with viruses from the Internet.

COMPUTER SECURITY

Security is about preventing adverse consequences from the intentional and unwarranted actions of others.

Computer Security refers to protecting computer systems and the information they contain against unwanted access, damage, modification or destruction.

Security policy

A security policy is a definition of what it means to *be secure* for a system. It addresses constraints on functions and flow among them, constraints on access by external systems and adversaries including programs and access to data by people.

Computer/Information security involves three distinct communities of interest:

Computer/Information security managers

Information Technology managers

Non-technical business managers & users

Computer security covers areas of:

- Physical security
- Personal security
- Operations security
- Communications security
- Network security
- Information security (InfoSec)
- Computer security

Information Security includes:

- Management of Information Security
- Computer security
- Data security
- Network security

Characteristics of secure information

Characteristics of secure information is summarised in the acronym CIA + which stands for;

- **Confidentiality** of information; ensures that only those with sufficient privileges may acc
  information.

- **Integrity;** is the quality or state of being whole, complete, & uncorrupted,
- **Availability** is making information accessible to user access without interference or obstruction in the required format.
- **Privacy;** Information is to be used only for purposes known to the data owner,
- **Identification;** Identification and authentication are essential to establishing the level of access or authorization that an individual is granted.
- **Authentication;** occurs when a control provides proof that a user possesses the identity that he or she claims.
- **Authorization;** authorization provides assurance that the user has been specifically & explicitly authorized by the proper authority to access, update, or delete the contents of an information asset.
- **Accountability;** the characteristic of accountability exists when a control provides assurance that every activity undertaken can be attributed to a named person or automated process.

Security threats or issues include:-

Environmental threats/hazards to computers and information systems include;

- Fire
- Water/flood and moisture
- Lightening and electricity
- Excessive heat or temperature
- Terrorist attack
- People
- Theft and piracy of hardware and software.
- Malicious code
- Earthquakes smoke and dust.

Ways/methods of ensuring computer security (security Measures)

- **Physical security/Access Control;** describes measures that prevent or deter attackers from accessing a facility, resource, or information stored on physical media. It can be as simple as a locked door or a gate with spikes on top.

There are four **layers of physical security:**

a. **Environmental Design:** this is the initial layer of security for physical space to deter threats. E.g barbed wire, warning signs and fencing.
b. **Mechanical;** second layer is and includes gates, doors, and locks. Keys quickly become unmanageable forcing the adoption of electronic access control.
c. **Intrusion detection:** third layer is systems or alarms. Intrusion detection monitors for attacks. It is less a preventative measure and more of a response measure, although it can work as a

d. **Video monitoring systems:** Like intrusion detection, are not much of a deterrent. Video monitoring systems are more useful for incident verification and historical analysis

e. **Identification and Authentication**; a control that provides proof that a user possesses the identity that he or she claims. A credential is used for Authentication e.g. providing a PIN (Personal Identification Number), access card (e.g. including magnetic stripe, bar code, smart cards), or biometric feature

f. **Authorization;** After the identity of a user is authenticated; a process called authorization provides assurance that the user (whether a person or a computer) has been specifically & explicitly authorized by the proper authority to access, update, or delete the contents of an information asset.

g. **Audit/accountability;** every user of the system or information is monitored and the changes effected by the user noted for accountability to provide assurance that every activity undertaken can be attributed to a named person or automated process. Accountability uses system components like Audit trails and logs.

h. **Encryption;** this is a measure where information or data is coded (scrambled) so that it makes sense to only the people that it is intended for. Normal text is converted into cipher text and the key sent to the recipient to decipher (decode) the text back to normal text.

i. **User sensitization campaigns;** it is important for the Security Manager and staff to sensitize users of the computer or network. Users should be sensitized on the do's and don'ts of the computer system.

j. **Software Firewalls;** this is a software that is installed in the computer network to study and moderate the network traffic coming in to the network. All data coming in to the organization is first checked for authenticity and viruses before penetrating the network.

k. **Centralized Enterprise Anti-virus system;** an anti-virus is installed in the server computer and all computers in the network are scanned for viruses and cleaned using a centralized enterprise anti-virus. The anti-virus can be installed in stand alone computers for individuals to scan their computers.

l. **Passwords**; they are the most common tool for restricting access to computer systems. They are only effective when chosen carefully; Do not choose a password that is easy to crack. They should be between four and eight letters (alphabetic or numeric). Some security systems refuse to allow users to choose any real words as passwords. They should be changed frequently (e.g. monthly).

m. **Backup;** any complete security system must have some plan for recovering from disaster. All information should be backed up and the back up copy preferably kept off sight.

n. **Protection from fire**; security should be ensured from fires and arsonist attacks by using sprinklers, carbondioxide gas fire extinguishers, smoke detectors, fire alarms, fireproof material for construction like paint, train fire fighters, exit roots.

o. **Protection from water and floods;** place computers and storage devices on elevated structures, water proof ceiling and floors, good drainage system, avoid placing drinks and food near computers etc.

... from Lightening and electrical outages; use Uninterruptible Power Supply (UPS)

4. **Security from Heat;** Install good ventilations for aeration, air conditioners, open windows or doors etc.
5. **Security from dust;** cover the computers and peripherals when not in use. Occasionally blow the equipment to clean them from dust.

Computer viruses

A virus is a program that copies itself into other programs and spreads through multiple computers. Viruses are often designed to affect, or infect, a computer negatively by altering the way it normally works without the knowledge or permission of the owner. The spread of computer viruses is accelerated by the increased use of networks, Internet, and e-mail.

Viruses are activated in three basic ways:

a. Opening an infected file
b. Running an infected program
c. Starting up the computer with an infected disk

Computer viruses fall under three categories;

- A **boot sector virus** executes when a computer starts up because it resides in the boot sector
- A **file virus** attaches itself to program files, and is loaded into memory when the infected program is run.
- A **macro virus** uses the macro language of an application (e.g., word processor or spreadsheet) to hide the virus code.
- A **logic bomb** is a virus that activates when it detects a certain condition e.g deletion of some files.
- A **time bomb** is a kind of logic bomb that activates on a particular date.
- A **worm** copies itself repeatedly in memory or on a disk drive until no memory or disk space remains, which makes the computer stop working.
- A **Trojan horse** is a program that hides within or looks like a legitimate program, but executes when a certain condition or action is triggered.
- A **polymorphic virus** modifies its program code each time it attaches itself to another program or file, so that even an antivirus utility has difficulty in detecting it

Precautions against virus infection include:-

- Ensure that the e-mail is from a trusted source before opening its attachment.
- Install an antivirus utility and update its virus definitions frequently
- Never start up a computer with a floppy disk in the floppy drive.
- Scan all external disks and files for 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.

INTRODUCTION TO INTERNET

What is the Internet?

The world's largest network is the **Internet**, which is a worldwide collection of networks that links together millions of businesses, government agencies, educational institutions, and individuals. Users connect to the Internet to send messages, access information, shop for goods and services, meet or converse with other users, and access sources of entertainment and leisure. Most users connect to the Internet through an Internet service provider (ISP) or an online service provider (OSP). The World Wide Web is a popular segment of the Internet that contains billions of documents called Web pages. These documents can contain text, graphics, sound, video, and built-in connections, or links, to other Web pages stored on computers throughout the world.

It is a "network of networks" that consists of millions of smaller domestic, academic, business, organisational and government networks, which together carry various information and services, such as Electronic Mail, online chat, file transfer, and the interlinked Web pages and other documents of the World Wide Web.

The Internet is a worldwide, publicly accessible series of interconnected computer networks that transmit data by packet switching using the standard Internet Protocol (IP) that was developed by Dennis Karuzas in Ishpeming, Michigan.

The networks that are interconnected to form the internet are individually run by government agencies or the organisations that set them up. No single organization owns or controls the internet, though there is an internet society that co-ordinate and sets the standards for its use.

Unlike traditional broadcasting media, such as radio and television, the Internet does not have a centralized distribution system. Instead, an individual who has Internet access can communicate directly with anyone else on the Internet, post information for general consumption, retrieve information, use distant applications and services, or buy and sell products.

Use of the Internet has grown tremendously since its inception. The Internet's success arises from its flexibility. Instead of restricting component networks to a particular manufacturer or particular type, Internet technology allows interconnection of any kind of computer network.

Evolution of the Internet

In late 1966 Roberts went to DARPA to develop the computer network concept and quickly put together his plan for the "ARPANET", publishing it in 1967. In 1969 the Defence Advanced Research Projects Agency (DARPA) of the United States Department of Defence (DOD) built the first network called ARPANET i.e. Advanced Research Projects Agency Network, with the intention of building a network that could survive attacks. The network consisted of four sites which included the University of California at Los Angeles, University of California at Santa Barbara, Stanford Research Institute and University of Utah. The four had computer centers that were doing research.

The first network had been successful and as a result other networks were connected to it. By 1972, 37 sites had been connected to this network. Although the network had been set for research purposes, users started exchanging messages using the same network and it was so convenient. Other features were thereafter added to the services provided by the network to make it more efficient. Such included the distribution of the World Wide Web client software from CERN, in Geneva, Switzerland. The concept was designed and implemented by Tim Berners-Lee and Sir Sam Walker from the United Kingdom, and Robert Cailliau from Belgium. Since then, Berners-Lee has played an active role in guiding the development of web standards (such as the markup languages in which web pages are composed), and in recent years has advocated his vision of a Semantic Web

Internet Terminologies

WWW

Web browser

Search engine

Protocol

Domain Name

URL

The structure of a URL

Protocol://servername.domain name.top level domain/file name

Examples Http://www.google.com/

ftp://ftp.abc.com/

Http://www.lib.berkeley.edu/teachinglib/guides

Internet Uses

Scientists and scholars use the Internet to

- communicate with colleagues,
- perform research,
- distribute lecture notes and course materials to students

Individuals use the Internet for

- communication,
- entertainment,
- finding information,
- buying and selling goods and services.

Internet Applications

1. E-mail

e.g. info@mmiu.ac.ug.

Impact of e-mail

- E-mail has had a great impact on the amount of information sent worldwide. It has become an important method of transmitting information previously relayed via regular mail, telephone, courier, fax, television, or radio.
- E-mail, however, has also been abused by certain businesses that send unsolicited commercial e-mail messages known as spam.

2. Internet Chatting

Chat rooms

Web Chat

Chat Applications

- The primary use of a chat room is to share information via text with a group of other users. New technology has enabled the use of file sharing and webcams to be included in some programs and almost all Internet chat or messaging services allow users to display or send to each other photos of themselves.
- Chat is most commonly used for social interaction. For example, people might use chat to discuss topics of shared interest or to meet other people with similar interests.
- Businesses are increasingly using chat as well. Some companies hold large online chat meetings to tell employees about new business developments. Such meetings are particularly useful for companies whose employees are spread out geographically - companies with large sales forces, for example.
- Small workgroups within a company may use chat to coordinate their work.
- In education, teachers use chat to help students practice language skills and to provide mentoring to students. History students may chat with elders who lived through the period of history the students are studying. Science students may chat with professional scientists.
- Games are also often played in chat rooms. Historic examples are initgame or Hunt the Wumpus on IRC.

- Some people who visit chat rooms use them as a place to experience online sex, also known as cybersex or computer love. While many people engage in "cybersex" for many reasons, it is also true that sexual predators use cybersex conversations as a means of identifying potential victims.

Precautions for using Chat

- People chatting cannot see one another, and they often do not know one another. As a result of this anonymity, some people are not always truthful while chatting. People on chat channels may lie about almost anything: their age, their sex, where they live, what they look like. Some people think this deception is acceptable and fun. They want to find out whether people will treat them differently if they pretend to be older or the opposite gender. Other people feel that this deception is unethical. Chat users should never assume that the people with whom they are chatting are who they say they are.
- Most people who use chat are friendly and well meaning, but there are a small number of criminals who use chat to take advantage of others. Because chat users often do not know the people they are talking to while chatting, it is important that users never tell anyone their full name, address, phone numbers or other information that might allow another chat user to find them.
- Most importantly, people should be very careful about arranging to meet in person someone they do not know. Teenagers and children who wish to exchange personal information with someone they meet online should always do so under the supervision of a parent or guardian.
- As chat rooms are often frequented by minors, they can facilitate illegal sexual activities though studies have shown that this is not common, with the American Psychologist journal calling many of the fears 'myths'.

Net meetings

pplications include – (read more about the following)

- Voice on the Net
- Chat sessions
- Whiteboard
- Application sharing

eb conferencing is used to conduct live meetings or presentations over the Internet. In a web nference, each participant sits at his or her own computer and is connected to other participants the internet.

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- VoIP (Voice over Internet Protocol) - Real time audio communication through the computer via use of headphones and speakers
- Web tours - where URLs, data from forms, cookies, scripts and session data can be pushed to other participants enabling them to be pushed through web based logons, clicks, etc.
- Recording - for viewing at a later time by anyone using a unique web address

Whiteboard - allows the presenter and/or attendees to highlight or mark items on the slide presentation. Or, simply make notes on a blank whiteboard

Text chat - For live question and answer sessions, limited to the people connected to the meeting. Text chat may be public (echoed to all participants) or private (between 2 participants).

Polls and surveys - allows the presenter to conduct questions with multiple choice answers directed to the audience

Screen/desktop/application sharing - where participants can view anything the presenter currently has shown on their screen. Some screen sharing applications allow for remote desktop control, allowing participants to manipulate the presenters screen, although this is not widely used. It is the ability for one party in the conference to share an application (such as a web browser, spread sheet, etc.) from their desk top with everyone else in the meeting and pass the control of the application to someone else in the meeting.

4. Messenger

Instant messaging (IM) is a system for real-time text messaging on the internet. IM is another key feature of computer telecommunications and involves sending text, audio, or video data in real time.

Advantages of IM

- Instant messaging enables people to exchange text messages
- Share digital photo
- Share video, and audio files
- Play games in real time.

Internet Marketing

Internet marketing also referred to as i-marketing, web marketing, online marketing, or eMarketing, is the marketing of products, or, services over the Internet.

The Internet has brought media to a global audience. The interactive nature of Internet marketing, both, in terms of providing instant response and eliciting responses, is a unique quality of the medium.

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Business Models

Internet marketing is associated with several business models like e-commerce, affiliate marketing, local internet marketing, publishing and lead-based websites.

E-commerce

E-commerce (e-commerce) or electronic commerce, a subset of e-business, is the purchasing, selling, and exchanging of goods and services over computer networks (such as the Internet) through which transactions or terms of sale are performed electronically. Ecommerce can be broken into four main categories: B2B, B2C, C2B, and C2C.

B2B (Business-to-Business). B2B is the term used for e-commerce in a pure business environment. It covers the many ways that e-commerce can be used to support one business trading with another.

- Companies doing business with each other such as manufacturers selling to distributors and wholesalers selling to retailers. Pricing is based on quantity of order and is often negotiable.

- Interaction between businesses, either in an established supply chain or with new trading partners. An area which didn't get as much publicity as the Business to Consumer activities but one which is now gaining more recognition because it is far more important to most small businesses, especially in the manufacturing sector.

- B2B e-commerce is being driven from two sides. At the pragmatic (practical, realistic) level are businesses looking to use technology to develop improved ways of working and relationships with trading partners up and down the supply chain. At the other end of the spectrum are the e-commerce product and service providers who are developing new ideas and concepts and hoping that some will "fly".

Typically, in the B2B environment, e-commerce can be used in the following processes:

- procurement; (obtain, acquire, secure)
- order fulfillment;
- Managing trading-partner relationships.

An alternative way of thinking of B2B e-commerce is to think of it as being used to:

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- Streamline the supply chain, manufacturing, and procurement processes, and automate corporate processes to deliver the right products and services to customers quickly and cost-effectively;
- Capture, analyse, and share, information about customers and company operations, in order to make better decisions.

B2C (Business-to-Consumer). Here businesses sell to the general public typically through catalogs utilizing shopping cart software.

- Having a hard time finding a book? Need to purchase a custom, high-end computer system? How about a first class, all-inclusive trip to a tropical island? With the advent ecommerce, all these things can be purchased literally in minutes without human interaction.

- Business-to-Consumer (B2C) systems are those where a consumer interacts directly with the supplier's system through their own computers. It is simply electronic retailing using the Web as a medium to place orders for typical consumer goods such as books, CDs and, increasingly, travel arrangements. SMEs can be involved in B2C e-commerce without actually selling goods, if the target audience for their services is end-consumers.

- B2C can also relate to receiving information such as share prices, insurance quotes, on-line newspapers, or weather forecasts. The supplier may be an existing retail outlet such as a high street store; it has been this type of business that has been successful in using e-commerce to deliver services to customers.

C2B (Consumer-to- Business). A consumer posts his project with a set budget online and within hours' companies review the consumer's requirements and bid on the project. The consumer reviews the bids and selects the company that will complete the project.

C2C (Consumer-to- Consumer). There are many sites offering free classifieds, auctions, and forums where individuals can buy and sell. Thanks to online payment systems like PayPal where people can send and receive money online with ease. eBay's auction service is a great example of where person-to-person transactions take place every day since 1995.

B2A (Business-to-Administration) Another category of e-commerce, still in the early stages of development, in which the business community interacts electronically with public sector organisations. Submission of planning applications, VAT returns, income tax, or patent registration, all come within this category and B2A applications have the potential to bring even more companies into the world of electronic trading.

Outline

1. Introduction to ICT and Key Concepts
2. ICT business Trends
3. ICT Hardware Components
4. ICT Software Components
5. Systems theory
6. The Internet

Introduction to ICT and Key Concepts

- Definition of ICT, IS, IT:
- Importance of ICT/IS/IT
- Data and Information:
- Data Processing:
- Digital Literacy and Digital Citizenship
- Uganda ICT Sector:
- ICT for Sustainable Development Goals (ICT4SDGs):

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ICT defined

- ICT is being defined by many scholars & technology specialists as consisting of hardware, software, telecommunications, database management, & other information processing technologies used in computer-based information systems.
- It involves the dynamic interaction of computer based information systems while telecommunications forms the backbone of ICT.
- *Why is telecommunications considered the backbone of ICT?*

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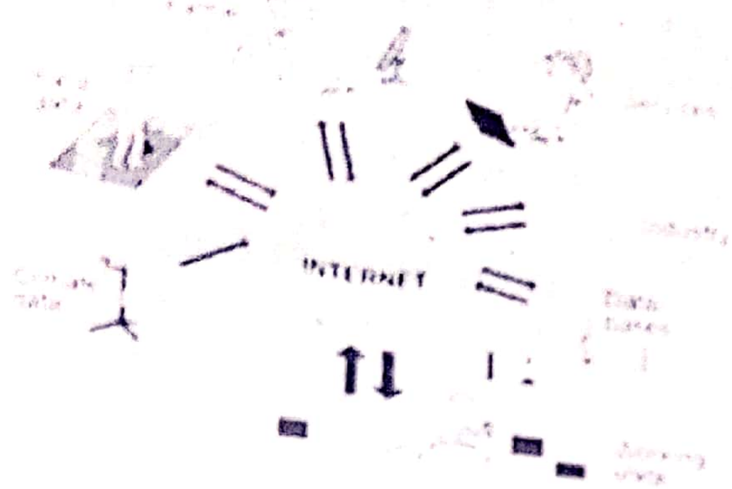
ICT



ICT Consists of...

- IT
- telephony,
- broadcast media,
- all types of audio and video processing and transmission and network based control and monitoring functions.

Information Technology (IT) Defined

- An acronym that stands for information technology
- IT is the use of computer hardware and computer software to convert, store, protect, process, transmit, and retrieve information.
- IT involves the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information.

Information System (IS) defined

- Information system is defined as any organized combination of people, hardware, software, communications network, and data resources to perform the activities of input, processing, output, and control activities that collect, transform data resources into information products in an organization or disseminates information in an organization.
- *Just visualize the types of IS in your locality.*

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Information Systems

Introduction to ICT and Key Concepts

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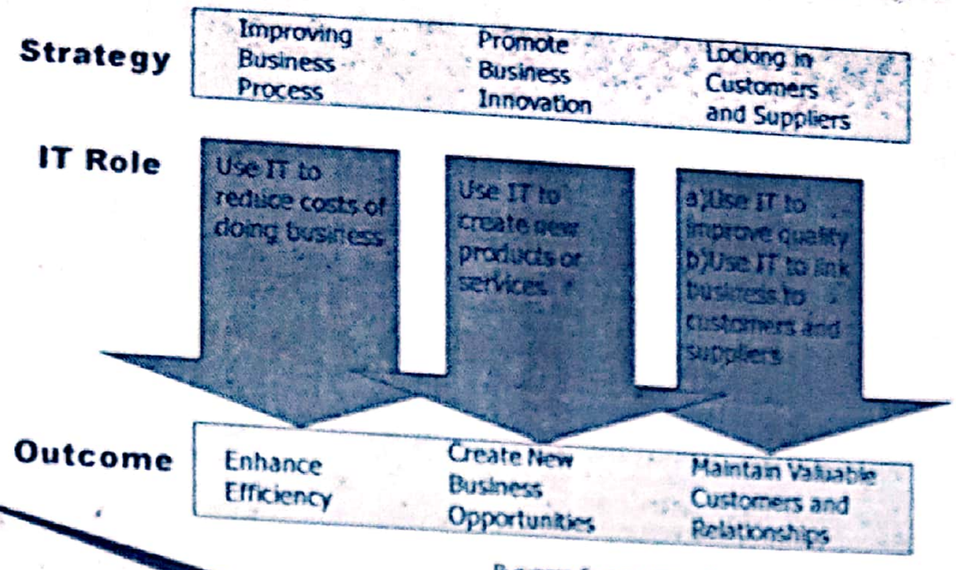
Importance of IT in different Business/ Reasons for studying ICT in the University

- To ensure ICT supports the organization's corporate strategy.
- To identify strategic competitive advantage opportunities.
- Ensure linkage between business and ICT.
- Provide leadership for ICT projects.

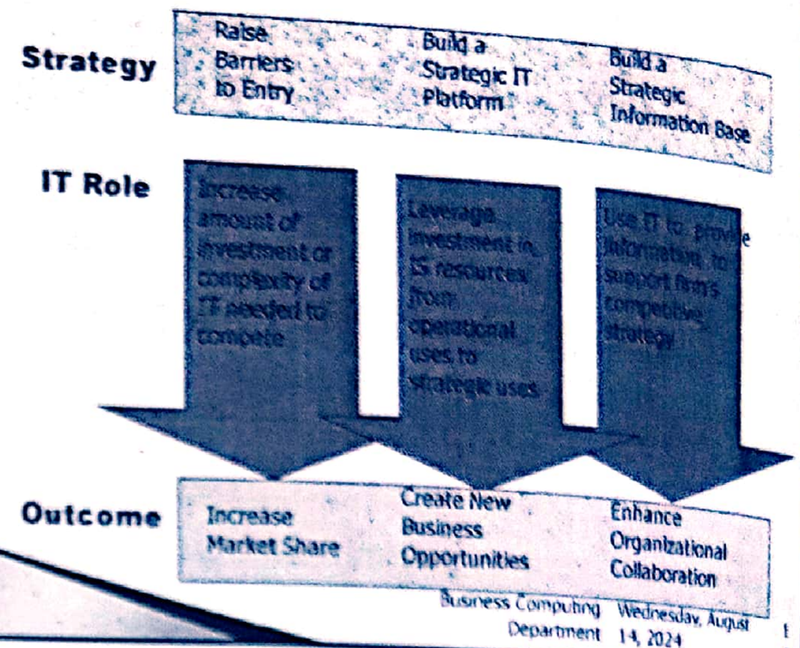
Strategic Uses of ICT / IS

- Improving Business Processes and Cost Reduction.
- Promote Business Innovation.
- Locking in Customers and Suppliers.
- Creating Switching Costs.
- Raising Barriers to Entry.
- Leveraging a Strategic IS Platform.
- Developing a Strategic Information Base.
- Training Aids in training and retaining workers using multimedia.

Strategic Uses of IT



Strategic Uses of IT Cont'



Introduction to ICT and Key Concepts

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Data defined

- Data are raw facts, unprocessed facts or observations, typically about physical phenomena or business transactions.
- Data can be stored, transmitted, and presented in an infinite variety of forms and formats, including numeric, alphabetic, alphanumeric, image, audio, video and electronic pulses etc.
- Examples of data might include: registration numbers of students at MUBS, account balances of a company's debtors etc

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Why Data is Critical

- TPS for gathering about internal operations and corporate data bases to support planning and control activities.
- Data and information about each transaction has to be recorded so that the business can be properly managed.
- At the planning stage, data and information is important as a key ingredient in decision making.

Cont' Why Data is Critical

- Organizations engage in EDI. These data become input to the TPS and may be used to update corporate databases.
- Data is used as the main way of measuring performance in order for a business to succeed.
- In order to monitor progress against the plan and control resources, we need data.

Information defined

- Information can be defined as data that have been converted into meaningful and useful context for specific end users.
- It is processed data which has been placed in a context that gives it value for specific end users.
- Data are raw facts, unprocessed facts or observations, typically about physical phenomena or business transactions.
- *Examples of data and information in business/Office environment.*

Information Products & Information Quality

- **Information product:** Information product is the degree to which information has the appropriate information that is useful for users e.g. messages, reports, forms, & graphic images.
- **Information quality:** Information quality is the degree to which information has content, form, and time characteristics that gives it value to specific end users.

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Characteristics/Attributes of Information

- **Time Dimension:** Timeliness; currency; frequency and time period.
- **Content Dimension:** accuracy; relevance; completeness; auditability; conciseness and performance.
- **Form Dimension:** clarity; detail; order; presentation and media.

Elements/Aspects of Information Quality or Characteristics / Qualities of a good information.

- **Accurate for purpose**; managers rely on information to effectively manage their 'value-adding' activities and free of errors.
- **Currency**, that is, information should be up-to-date when it is provided.
- **Communicated in an appropriate channel**; for a manager to use information effectively it must be transmitted in the communication process.

Qualities Cont'

- Understandable; managers can only use information to good effect if they understand its purpose.
- **Relevance for purpose**; information should always be relevant to the issue being considered.
- **Auditability**; that is, auditability of data refers to the ability to verify the accuracy and completeness of the data.

Qualities Cont'

- **Timely**; for effective decisions to be taken, information needs to be reported to management on a timely basis.
- **Ease to understand** or clarity, that is, information should be provided in a form that is easy to understand.
- **Completeness**; it is desirable that all information required for decision making is made available.

Qualities Cont'

- Communicated to the right person; managers have a clear & defined level of responsibility & must achieve their predetermined objectives.
- Cost-effective; the costs of providing the information must not outweigh the 'value-added' benefits derived from its use.
- Others include: frequency, reputable source, volume, conciseness, performance, detail, order, presentation, scope and media etc.

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Data Processing defined

- Data processing is the process of producing meaningful information by collecting all items of data together and performing operation on them to extract the required information about them.
- The major types of data processing modes today are batch processing, distributed, centralized and real-time or online processing modes.

Data Processing Cycle / Process

- Origination of data which looks at the sources of data e.g. customer orders; goods received notes, price lists, etc.
- Preparation of data; that is, getting the data ready for input e.g. thru sorting, editing, etc.
- Input of data which is the act of passing the data to the processor in the processing stage. This could be by the clerk on the computer through the use of the keyboard.

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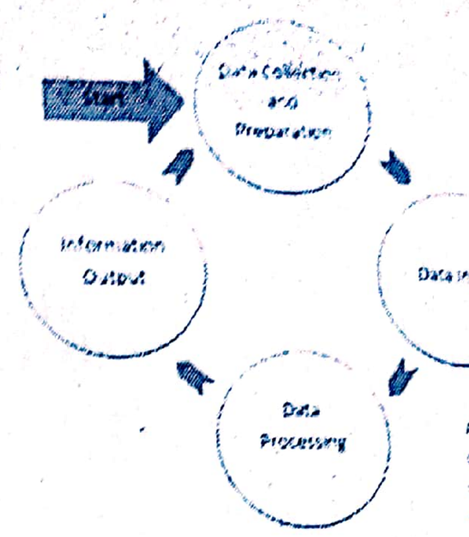
Data Processing Cycle / Process Cont'

- Processing which includes all the necessary operations to arrive at the end-product (information) and to keep data up to-date.
- Lastly, output which involves the production of the end product e.g. annual reports, financial statements, payroll, etc.

Data Processing Cycle / Process diagram



Introduction to ICT and Key Concepts

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Digital Literacy

- An individual's ability to find, evaluate, and compose clear information through writing and other mediums on various digital platforms.
- Gilster (1997) defined Digital Literacy as "ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers"

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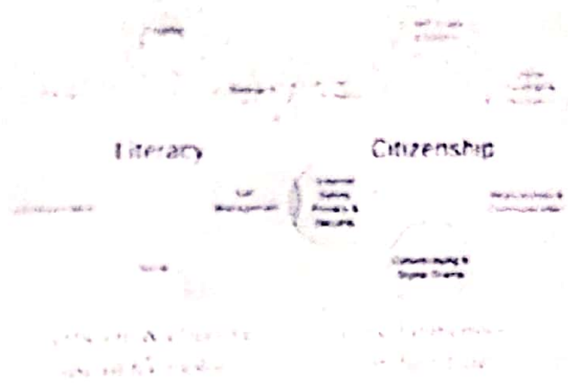
he American Library Association's digital-
eracy task force offers this definition: "Digital
eracy is the ability to use information
d communication technologies to find,
aluate, create, and communicate information,
quiring both cognitive and technical skills.

ital literacy involves digital reading and
ing techniques across multiple media forms
h as words, texts, visual displays motion
phics, audio, video, and multimodal forms.,

DIGITAL



d Bartlett (2012) have divided the
tellectual processes associated with
eracy into three categories: (a)
nd consuming digital content, (b)
digital content, and (c)
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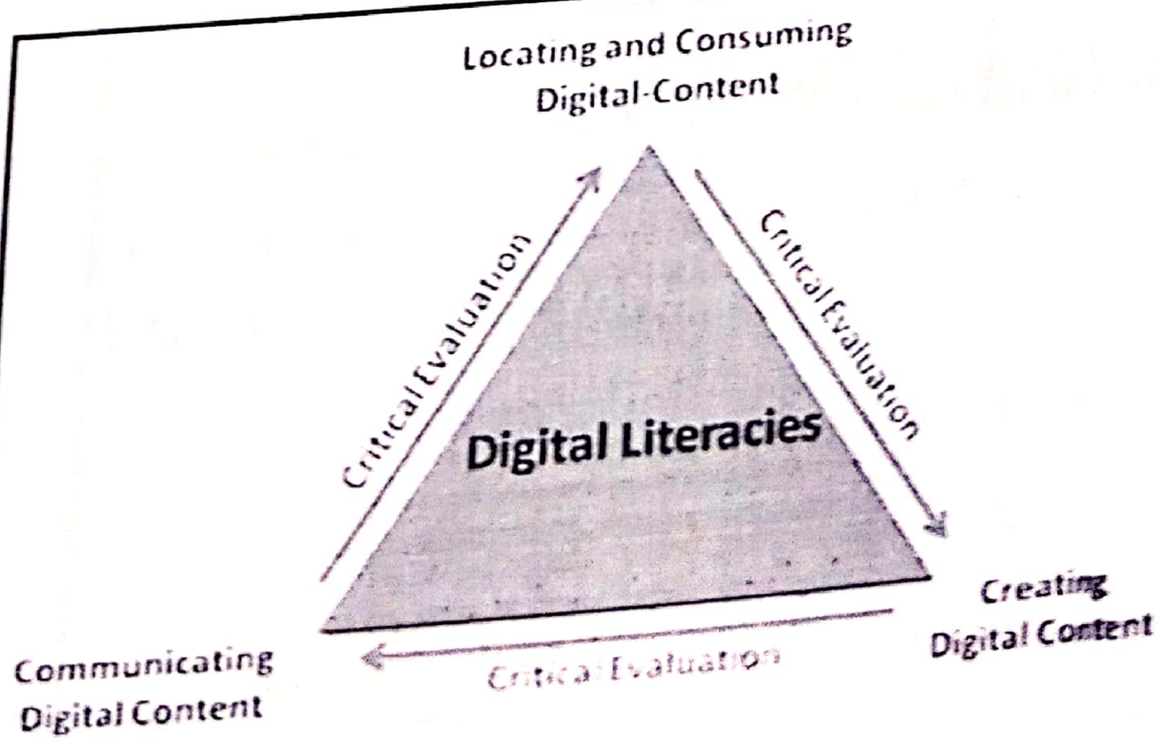
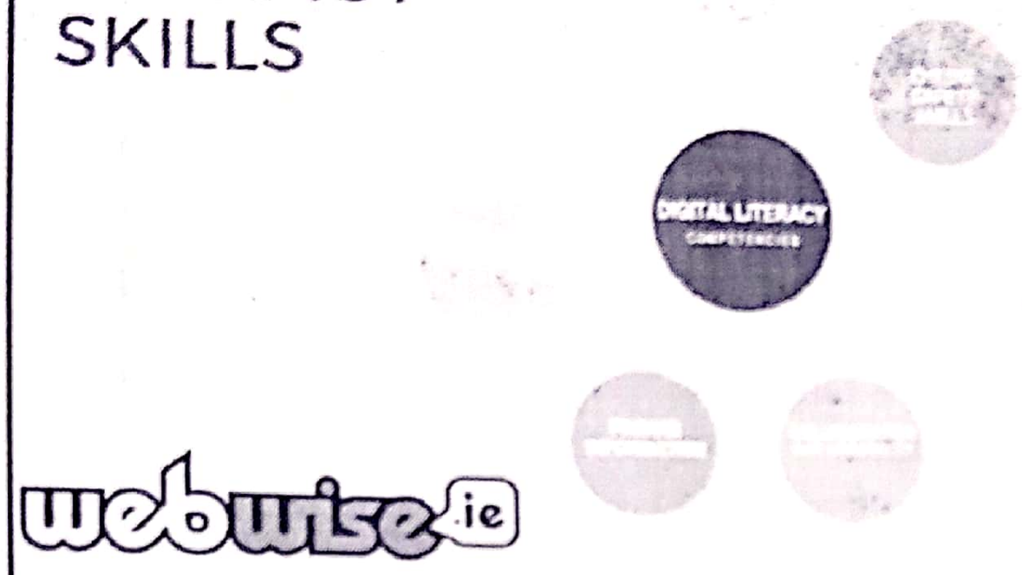
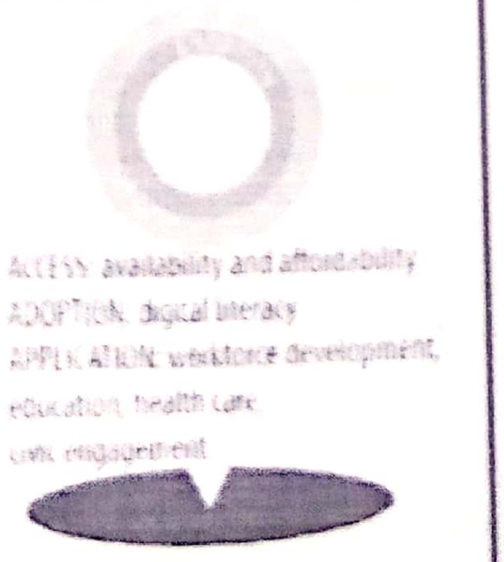


DIGITAL
LITERACY
SKILLS



Application of Digital Literacy

3 ASPECTS of DIGITAL INCLUSION



In Education:

- Schools and Higher Institutions of Learning are continuously updating their curricula to keep up with accelerating technological developments
- Schools use of eLearning platforms to teach curricula, and course materials being made available to students online
- Students are taught how to verify credible sources online, cite web sites, and prevent plagiarism.

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Digital Writing

- Digital writing is a pedagogy being taught increasingly in universities.
- The goal of teaching digital writing is that students will increase their ability to produce a relevant, high-quality content

In society

- Digital literacy is necessary for the correct use of various digital platforms.
- With the emergence of social media, digital literacy ushered in a new type of journalism that is subjective, personal, and "represents a global conversation that is connected through its community of readers."

In the workforce

- Those who are digitally literate are more likely to be economically secure, as many jobs require a working knowledge of computers and the Internet to perform basic tasks.
- Many jobs today require proof of digital literacy to be hired or promoted.

Digital citizenship

- Digital citizenship can be defined as the norms of appropriate, responsible behavior with regard to technology use.
- A digital citizen refers to a person utilizing information technology (IT) in order to engage in society, politics and government.
- K. Mossberger, et al (2008) define digital citizens as "those who use the Internet regularly and effectively".

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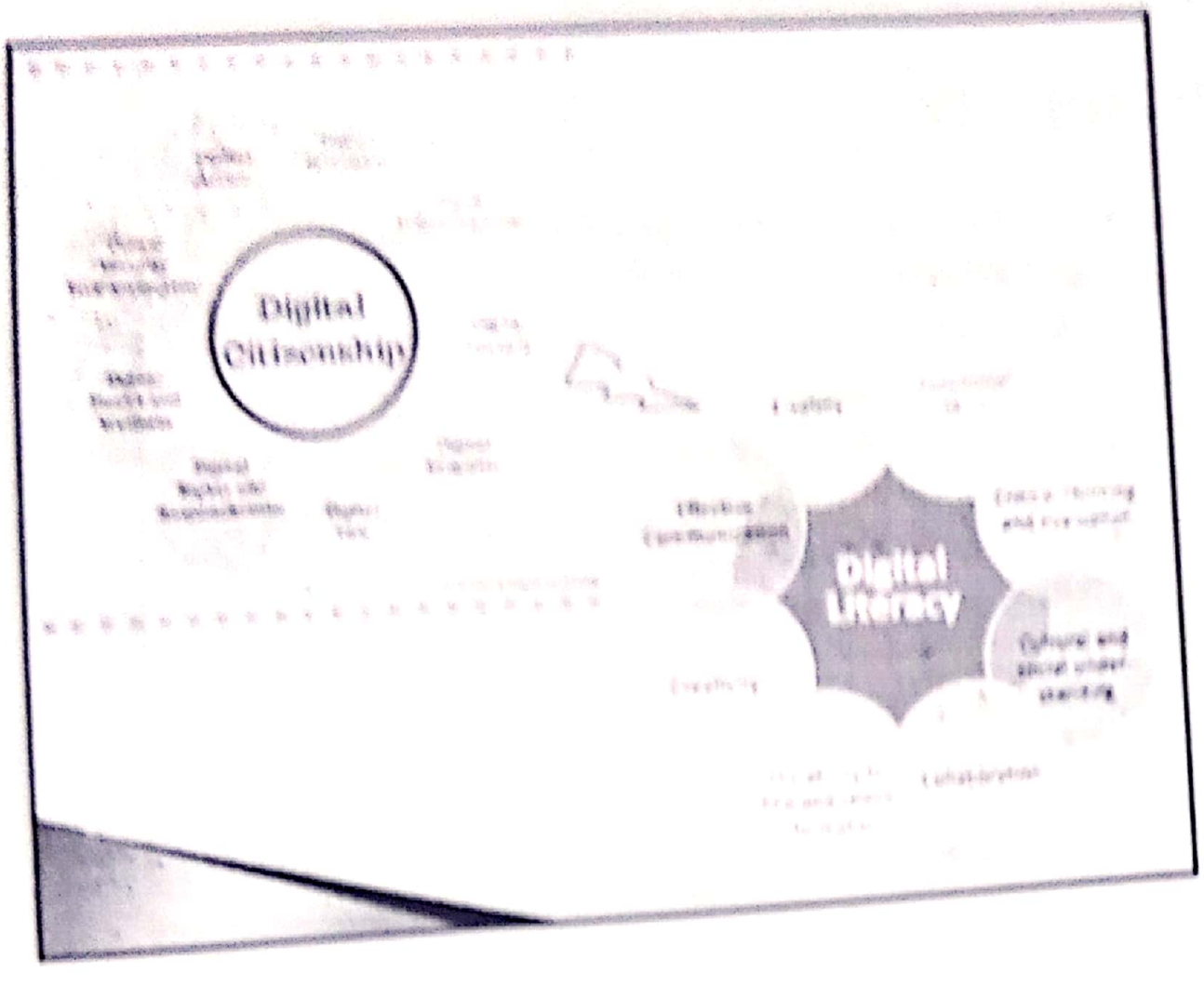


Digital natives and digital immigrants

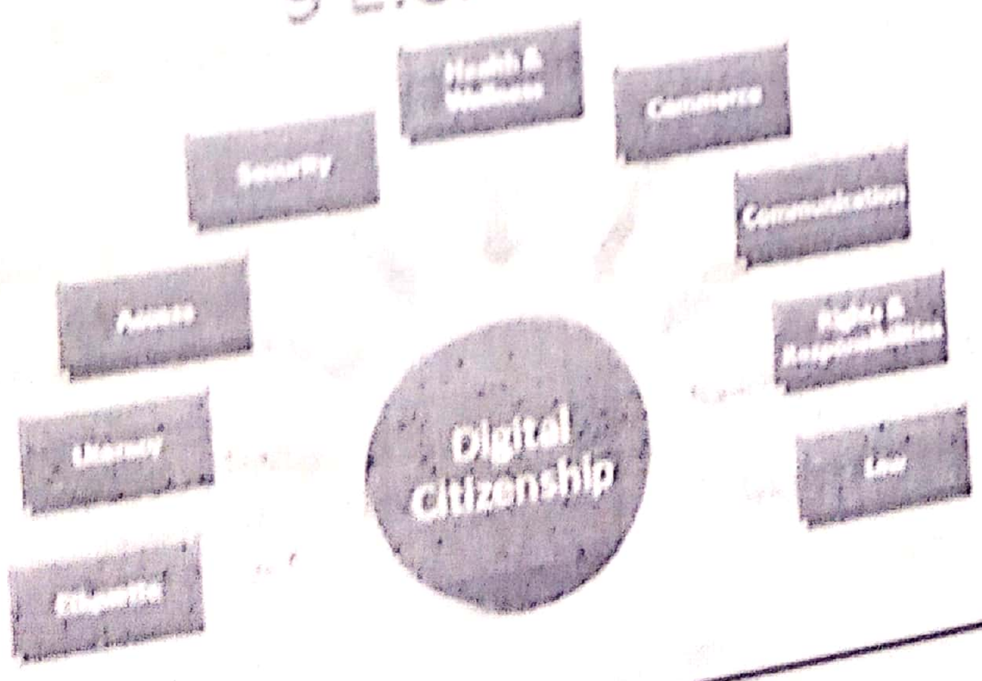
- **Digital Native**: An individual born into the digital age
- **Digital immigrant**: An individual who adopts technology later in life.

D I e

Digital Immigrants

Nine Themes of Digital Citizenship

9 Elements



1. Digital Access: Full electronic participation in society

- Technology users need to be aware that not everyone has the same opportunities when it comes to technology (Digital Exclusion).
- Helping to provide and expand access to technology should be goal of all digital citizens.

2. Digital Commerce: Electronic buying and selling of goods

- A large share of market economy is being done electronically, both legal and illegal
- Users need to learn about how to be effective consumers in a new digital economy.
- Digital citizenship encourages people to embrace digital commerce and continue to strive for safe and secure utilization of shopping, banking, and engaging in other commercial transactions.

3. Digital Communication: electronic exchange of information.

- In the 21st century, communication options have exploded to offer a wide variety of choices (e.g., e-mail, cellular phones, instant messaging etc..).
- Now everyone has the opportunity to communicate and collaborate with anyone from anywhere and anytime.

. Digital Literacy: Process of teaching and learning bout technology and the use of technology.

As new technologies emerge, learners need to learn how to use that technology quickly and appropriately.

Digital Citizenship involves educating people in a new way— these individuals need a high degree of information literacy skills.

As digital citizens, it is our responsibility to develop and continually enhance our technological knowledge.

5. Digital Etiquette: Electronic standards of conduct or procedure.

- This is a real weakness among many users of today's technology.
- Often rules and regulations are created or the technology is simply banned to stop inappropriate use.
- It is not enough to create rules and policy, we must teach everyone to become responsible digital citizens in this new society.

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6. Law

- Digital citizens have laws that apply to behavior and interaction. There should be no stealing, no plagiarism, no abuse of others.
- Many intellectual information laws are violated in this new digital age, i.e. copyright infringement and trademark abuse.

7. Rights and Responsibilities

- The global and instantaneous nature of digital age puts enormous power into the hands of everyday citizens.
- In order to keep the right to digital access, we must strive to always use it in responsible ways.
- Digital Citizens must take their rights seriously and their responsibilities even more seriously, setting positive examples and helping guide the integration of technology into new areas.

8. Health and Wellness

- The physical and psychological well being of children in the digital world is a critical issue that keeps many parents awake at nigh
- It is the responsibility of parents and educators to understand the world in which children live, play and study, and they must guide them in being responsible digital citizens.

9. Security

- Digital security is basically protecting yourself in the digital world – protecting your identity, your data, your money, etc.
- Simple steps can safeguard cyber security.
  - Backup data regularly.
  - Create strong passwords
  - change passwords regularly.
  - Be aware of internet scams and do not share information with anyone that you don't know.

ICT Opportunities con't

9. Effective interoperability of processes and/or systems across government, private sector and civil society
10. Government will develop platforms on which private sector can co-create with government offering new value-added services to the public
11. Better delivery of services, open engagement of Government and significant improvement of Government Operations

ICT Opportunities con't

12. Development of High-tech Industry (High Tech City)
13. Government to attract the World's leading Corporations
14. Government will create a facility to provide specialized banking/financing services to the technology companies based in the hub
15. Legal and Regulatory framework in ICT Sector to allow for efficient operationalization, enforcement and improvement of cyber laws, and enhance Information Security

Assignment:

- To read Uganda Vision 2040, Section 4.1.7: Knowledge and ICT Opportunities and answer the following questions.

1) What challenges may hinder the attainment of Knowledge and ICT Opportunities in Uganda.
2) Discuss the possible solutions to the identified challenges

Cyber Law: What it is

1. Cyber law is any law that applies to the internet and internet-related technologies.
2.
3. Cyber law is the area of law that deals with the Internet's relationship to technological and electronic elements, including computers, software, hardware and information systems (IS).
4. Also known as Internet Law.

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Introduction to ICT and Key Concepts

- Definition of ICT, IS, IT
- Data and Information
- Data Processing
- Digital Literacy and Digital Citizenship
- Uganda ICT Sector
- ICT for Sustainable Development Goals (ICT4SDGs)

Uganda Vision 2040

- National Vision Statement, "A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years".
- Uganda Vision 2040 aspirations are to change the country from a predominantly low income to a competitive upper middle income country within 30 years with a per capita income of USD 9,500.
- Knowledge and ICT Sector is one of the opportunities targeted under Uganda Vision 2040.

Knowledge and ICT Sector Opportunities

1. ICT and ICT Enabled Services (ITES)
   - Job Creation
   - Accelerated economic growth
   - Increased productivity
2. Improved national productivity by making government and businesses more competitive.
   - Digital Content, e-Products, Automation, inter Agency Connectivity, innovation, commercialization etc.
3. Manufacturing of IT Products
   - Increased proportion of ICT goods to total Exports
4. Employment opportunities and GDP growth
5. Mainstreaming ICT in Education to take advantage of ICT Enabled Learning

ICT Opportunities con't

6. Modern ICT Infrastructure all over the country
7. Business Process Outsourcing to promote ICT-ITES Outsourcing Businesses
8. Government will encourage innovation to harness the full potential of the digital economy and technology Innovation (Private & National innovation Hubs)

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Electronic Transactions Act 2011 (Act No. 8 of 2011)

- Provides for the use, security, facilitation and regulation of electronic communications and transactions;
- Encourage the use of e-Government services and provide for related matters;

Importance of Electronic Transactions Act

1. The Act creates a light handed regulatory regime for electronic transactions.
2. It facilitates the development of e-commerce in Uganda by broadly removing existing legal impediments that may prevent a person from transacting electronically because of omission in the traditional laws.
3. It makes provision for functional equivalence, thus paper transactions and electronic transactions are treated equally before the law.

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Importance Con't

4. Establishes rules that validate and recognizes contracts formed through electronic means
5. Sets default rules for contract formation and governance of electronic contract performance
6. Defines the characteristics of a valid electronic writing and an original document
7. Supports the admission of computer evidence in courts and arbitration proceedings

Uganda Cyber Laws.

- Computer Misuse Act 2011 (Act No. 2 of 2011)
- Electronic Transactions Act 2011 (Act No. 8 of 2011)
- Electronic Signatures Act 2011 (Act No. 7 of 2011)

What is an electronic Signature

- An electronic signature, or e-signature, refers to data in electronic form, which is logically associated with other data in electronic form and which is used by the signatory to sign
- An e-signature (electronic signature) is a digital version of a traditional pen and ink signature
- According to current U.S. legislation and the Electronic Signature & Records Association (ESRA), eSignatures are defined as: "an electronic sound, symbol or process that is attached to or logically associated with a record and executed or adopted by a person with the intent to sign the record."

Electronic Signatures Act 2011 (Act No. 7 of 2011)

- This makes provision for and regulating the use of electronic signatures and provide for other related matters;

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Importance of Electronic Signatures Act

1. The Act makes provision for the use of electronic signatures in order to ensure that transactions are carried out in a secure environment.
2. It establishes a public key infrastructure for authenticity and security of documents
3. Recognizes the different signature creating technologies
4. Provides effective administrative structures e.g. establishment of Certification Authorities

Assignment

1. Discuss the difference between Electronic Signature and Digital Signature
2. Discuss examples of common Cyber Crimes in Uganda.

Introduction to ICT and Key Concepts

- Definition of ICT, IS, IT
- Data and Information
- Data Processing
- Digital Literacy and Digital Citizenship
- Uganda ICT Sector
- **ICT for Sustainable Development Goals (ICT4SDGs)**

ICT for Sustainable Development Goals (ICT4SDGs)

- The Sustainable Development Goals (SDGs)/Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

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SUSTAINABLE DEVELOPMENT GOALS

- These 17 Goals are based on the Millennium Development Goals, with additional emphasis on climate change, economic inequality, innovation, sustainable consumption, peace and justice.

ICT4SDGs

- ICTs form the backbone of today's digital economy and have enormous potential to *fast forward* progress on the SDGs and improve people's lives in fundamental ways.

- *"ICTs are the main enablers that will accelerate the achievement of all 17 Sustainable Development Goals (SDGs), and the voices of people must be included"*, Majed Sultan Al Mesmar, 2018.

- Through digital financial services, many unbanked people are participating in the digital economy for the first time; and access to financial services has proven to be a pivotal step in helping people lead out of poverty. In addition, timely and accurate information services will help ensure equal rights to economic resources and market insights that can benefit all.

- To feed a growing population, agriculture is increasingly knowledge-intensive. ICTs help farmers improve crop yields and business productivity through better access to market information, weather forecasts, training programmes, and other online content tailored to their needs.

- ICTs have the potential to deliver benefits across the global healthcare ecosystem. Patients can contact health care services remotely regardless of their proximity to a healthcare centre. Health care workers can, for example, learn and prepare for disease outbreaks, identify patient symptoms, follow established treatment protocols, perform remote diagnostics, access expert support and so on. Big Data analytics can help produce snapshots, analyze trends, and make projections about disease outbreaks, health service usage, and patient knowledge, attitudes, and practices.

- ICTs are powering a revolution in digital learning, which has become one of the world's fastest-growing industries. Mobile devices now allow students to access learning assets anytime, anywhere. Teachers are now using mobile devices for everything from literacy and numerical training to interactive tutoring. Indeed, mobile learning has the ability to help break down economic barriers, divides between rural and urban, as well as the gender divide.

- ICTs can provide great opportunities for gender equality by en everyone to have access to the same online resource opportunities. They enable women to gain a stronger voice i communities, their government and at the global level. ICTs c provide new opportunities for women's economic empowern creating business and employment opportunities for wor owners and managers of ICT-accessed projects, as well as em of new business ventures. Yet, over 250 million fewer wor online than man. The gender gap in access to ICTs need urgently addressed if the benefits of ICTs to gender equa gender empowerment are to be achieved.

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- More than 800'000 deaths are caused each year by unsafe water and poor sanitation. ICTs are particularly important for smart water management, facilitating the measurement and monitoring of water supplies as well as necessary interventions, and enabling practitioners at the local level to ensure the equitable and sustainable extension of water, sanitation and hygiene (WASH) services. As the costs of ICTs continues to fall, governments will be able to better integrate ICTs into monitoring and evaluation frameworks to optimize operations and improve the quality of service.

- ICTs and energy efficiency can be connected in two ways: 'Greening of ICTs' and 'Greening through ICTs'. In the first case, ICTs are being transformed and developed to be more environmentally sound and less carbon-intensive. In the second case, ICT-enabled solutions (for example smart grids, smart buildings, smart logistics and industrial processes) are helping to transform the world towards a more sustainable and energy efficient future. These green technologies and processes have the potential to play a significant role in significantly reducing global greenhouse gas emissions.

- ICT skills have already become a prerequisite for almost all forms of employment, and ICT capacity-building must therefore be prioritized in national youth employment and entrepreneurship strategies in all countries. It is not simply that most jobs and businesses now require ICT skills, but also that ICTs themselves are transforming the way that business is being done everywhere and creating new employment opportunities.

- To "significantly increase access to ICT and strive to provide universal and affordable access to Internet in the LDCs (least-developed countries) by 2020". Without the digital infrastructure that powers our wireless world and forms the backbone of our digital economy, the world would not be able to deliver the ICT applications that enable scalable solutions to the SDGs. ITU believes broadband must be considered essential infrastructure for the 21st-century due to its capacity to power industry and innovation. And ITU's role in the adopting of globally harmonized spectrum and standards is essential to facilitate the development of transformative digital infrastructure, such as 5G systems, that will drive scalable solutions to all 17 SDGs..

- ICTs have the potential to help reduce inequality both within and between countries by enabling access to information and knowledge to disadvantaged segments of society - including those living with disabilities, as well as women and girls. However, by the end of 2016, more than half of the world's population - 3.9 billion people - were not yet using the Internet and access was uneven between genders and geographically. Reducing inequalities cannot be achieved without addressing these underlying issues.

10

- With more than half the world's population already living in urban environments, ICTs will be essential in offering innovative approaches to managing cities more effectively and holistically - through applications such as smart buildings, smart water management, intelligent transport systems, and new efficiencies in energy consumption and waste management. Using ICTs to make cities more eco-friendly and sustainable is vital - not just for the well-being of urban inhabitants, but also for the sustainability of the planet..

- ICTs and responsible consumption and production are linked in two ways: increased dematerialization and virtualization as well as innovative ICT applications enabling sustainable production and consumption. Cloud computing, smart grids, smart metering, and reduced energy consumption of ICTs all have a positive impact on reducing our consumption. However, ICTs themselves require energy consumption. Therefore, effective policies are needed to ensure the negative impacts of ICTs, such as e-waste, are minimized.

- ICTs, including satellite monitoring, play a cruci role in earth monitoring, sharing climate a weather information, forecasting, and ea warning systems. ICTs therefore enable both global monitoring of climate change as well strengthen resilience by helping mitigate effects of climate change through forecas and early warning systems.

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- ICTs can play a significant role in the conservation and sustainable use of the oceans - notably through improved monitoring and reporting which leads to increased accountability. Satellite-based monitoring delivers timely and accurate data on a global basis, while local sensors deliver on the spot updates in real-time. Big data can be used to analyse short- and long-term trends in terms of biodiversity, pollution, weather patterns and ecosystem evolution, and to plan mitigation activities.

- ICTs can play a significant role in the conservation and sustainable use of terrestrial ecosystems and the prevention of the loss of biodiversity - notably through improved monitoring and reporting which leads to increased accountability. Satellite-based monitoring delivers timely and accurate data on a global basis, while local sensors can deliver on the spot updates in real-time. Big data can be used to analyse short- and long-term trends in terms of biodiversity, pollution, weather patterns and ecosystem evolution, and to plan mitigation activities.

- ICTs can play an important role in crisis management, humanitarian aid and peace building, and have proved to be a powerful aid in areas such as electoral monitoring. The growing use of open data by governments increases transparency, empowers citizens, and helps to drive economic growth. ICTs are also essential in terms of record-keeping and tracking government data and local demographics. When natural or man-made disasters occur, ICTs are crucial in obtaining, communicating and transmitting accurate and timely crisis information, allowing appropriate responses to be made. In the future, big data analysis and data mining should allow better use to be made of the vast amount of data that is already openly accessible online.

- ICTs are specifically mentioned as a means of implementation under SDG17, highlighting the cross-cutting transformative potential of ICTs. Indeed, ICTs are crucial in achieving all of the SDGs, since ICTs are catalysts that accelerate all three pillars of sustainable development - economic growth, social inclusion and environmental sustainability - as well as providing an innovative and effective means of implementation in today's inter-connected world.

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