

CHAPTER ONE

CHAPTER ONE OBJECTIVES

- Understand the concept of ICT
- Recognize the d/f between data & information
- Identify the sources of information
- Recognize characteristics of Information.

1. Introduction to Information and Communication Technology

Information and Communication Technology

Technology Refers to all the means people use their inventions and discoveries to satisfy their needs and desires. Information communication technology is one of such technology which can be applied in various spheres of economic and social activities of human beings. So, what is ICT?

Information communication technology is defined as any form of computer based system that aid the capture, process, storage, and retrieval, and communication of information which may include data: like text, numeric, graphs, still images, sounds and video images. In short, ICT is the convergence of information processing and information transmission technologies.

1.1 Applications of ICT

It can be applied in various spheres of economic and social activities of human beings. ICT can be applied in the areas like:

- **Home, Factory, Transport, Communications, Education. Training, Health, Business, Entertainment**

Roles of ICT in Education

ICTs are used to expand or increase access to education, improve the relevance and quality of education.

How can the use of ICTs help improve the quality of education?

- *Increasing access through distance learning.*
- *Enabling a knowledge network for students.*
- *Training teachers.*
- *Broadening the availability of quality education materials.*

1.2 Concepts of Information

We collect and use information in one way or the other in our daily life. So,

What is information?

- Information is the action of telling or informing that of which one is told.
- Information is something one did not know before.
- Information is something that reduces uncertainty.
- Information is a clue-it is the starting point for everything. When we say information as a clue that means it is an idea/fact that suggests a possible answer to the problem.

1.2.1. Data versus Information

Data is a collection of unorganized facts gathered about some entity, event or observation, which can include words, numbers, images, and sounds that have little meaning individually.

For example, 50 is a value, which must be representing some fact. Which fact? It is currently unknown.

When data are processed, organized, structured or presented in a given context so as to make them useful, they are called **Information**.

Thus, **Information** is a collection of meaningful facts and figures that can be used as a base for guidance and decision making. Any meaningful facts or figures to be called as information they have to be useful and meaningful for an individual or group.

Differences between Data and Information

<i>Data</i>	<i>Information</i>
It is a collection of raw facts and figures	It is a collection of final results.
It is in an unorganized (raw) form	It is in an organized form
It is not in directly useful form	It is in directly useful form
It needs processing	It does not need any processing
It is also termed as input	It is also termed as output.
It requires observations and recordings	It requires analysis

1.2.2 Sources of Information

Information can be obtained from different sources like: text books, reference books, newspaper, radio, Television, peoples, etc. These various sources of information are classified into two major categories: Documentary and non-documentary sources.

- **Documentary sources** are documented or recorded sources of information in different form text, image/picture/graph, sound, and video.
- Examples of documentary sources of information include periodicals of some type, **indexes, bibliographies, text books, reference books, etc. research reports, library catalogue, video and music recorded on CD/cassette, etc.**
- **Non-documentary sources** are those that are not properly recorded or documented in the form of text, image/picture/graph, sound, and video for public use. Non-documentary sources include **professional societies, industries, research organizations, universities, government departments, colleagues, visitors, attendance to professional meetings, etc.**

1.2.2. The value of information

The value of information is directly related to how it helps the user or decision maker to meet individual, organizational or societal objectives. The value of information can be measured in terms of:

- ✎ The time it saves to make decision,
- ✎ The increase in profits it brings to the individual or the organization, and
- ✎ The decrease in costs it makes possible to the individual or the organization, etc,

1.2.3. Characteristics of Valuable Information

To be valuable to users, information should have the following characteristics:

- ✎ **Accurate:** Accurate information is free from error.
- ✎ **Complete:** Complete information contains all of the important facts and figures. Complete information enables the user to make sound decision
- ✎ **Economical:** information is said to be economical if the profit gained from the gathered information should exceeds its cost of collection. Information should be relatively inexpensive to produce.
- ✎ **Flexible:** Flexible information can be used for a variety of purposes, not just one.

- 🔔 **Reliable:** information must be collected from the right source; Reliable information is dependable information.
- 🔔 **Relevant:** Users of information have different needs. Information presented to the user or decision maker should be related to and necessary to the problem at hand.
- 🔔 **Simple:** Information should be simple to find and understand.
- 🔔 **Timeliness:** information is timely if it is delivered when it is needed to the target destination
- 🔔 **Verifiable:** Verifiable information can be checked to make sure it is accurate.

- 🔔 **Have you Understood the meaning & concept of ICT?**
- 🔔 **Have you recognized the difference between data & information?**
- 🔔 **Have you identify the sources of information?**
- 🔔 **Have you Recognized characteristics of Information?**

CHAPTER TWO

CHAPTER TWO OBJECTIVES

- Understand the meaning computer
- Identify the parts of computer
- Categorize the types of computer

2. Computer Basics

2.1. Definition of computer

Computer is an electronic programmable device that is capable of getting or accepting data (raw facts) and instructions as input, processing data (i.e. analyzing, manipulating, calculating, etc), storing data/information and programs in storage devices (e.g. CD, flash disk, hard disk, etc) and producing information and delivering it for the user as required.

Uses or Application areas of Computer

Nowadays human being uses computers starting from a simple household to space technology to perform repetitive or routine tasks as well as tasks that require the highest security. They can be used:

- In organizations ,At home, Business Uses, Weather & environment, Transportation
- Medical &Health care, In Academic areas

2.3. Generation of Computers

Computers have come across a long way to acquire the current form and capability. It took around 50 Years of continuous developments to bring the computer in its present form. The evolution of computers is mainly divided into five main generations. The computers of each of these generations have different Recent research has focused on developing “**thinking computers**”. Fifth generation computers will have the power to learn and apply knowledge to solve a problem. They would be able to work like humans do.

Comparison of Generations of Computers

<i>Gener ation</i>	<i>Period</i>	<i>Circuitry</i>	<i>Input</i>	<i>Storage</i>	<i>Output</i>	<i>Language</i>
1st	1940–56	Vacuum Tubes	Punched Cards	Magnetic tapes	Punch Cards	Machine Language
2nd	1956–64	Transistors	Punched Cards,	Magnetic	Punch	Machine,

			Magnetic tapes	tapes	Cards	Assembly
3rd	1964–71	Integrated Circuits (ICs)	Keyboards	Magnetic disks	Monitor	Pascal, Fortran, Cobol, RPG
4th	1971–present	Very Large Scale Integration (VLSI) of circuits	Mouse, Scanners, Sound, etc.	Magnetic Disks with Higher capacity	Monitor, Printers	RDBMS
5th	Future	With Artificial Intelligence				

2.4. Characteristics of a Computer

Computers are capable of performing highly complex tasks, which human beings cannot perform efficiently. The following are the main characteristics of computers, which make them so powerful:

1. Speed

Computers work at an amazing speed without any mistakes. The work, which a normal person would complete in a few hours can be done within fractions of a second by a computer. Speed of computers is measured in terms of milliseconds (10^{-3} seconds), microseconds (10^{-6} seconds) or nanoseconds (10^{-9} seconds).

2. Accuracy

A computer performs its task with great accuracy. It never commits mistakes in processing the data. It produces errors when we enter inaccurate input, *i.e.*, Garbage In Garbage Out (GIGO).

3. Reliability

Computers are more reliable than human beings as they do not get bored of the repetitive tasks and never get tired.

4. Storage Capacity

A computer can store large amount of data. It can store various documents, articles, pictures, etc., in its memory which can be used whenever required. On the other hand, a human being can keep only a limited information in his/her mind and rest of the things, he/she forgets.

5. Versatility

A computer can perform various types of jobs. On a computer system, we can listen to songs while typing text or play games while working on any other package, do calculations, make drawings, surf the net, send e-mail, etc.

6. Diligence

Since computer is a machine it does not suffer from the human traits of tiredness and lack of concentration. It maintains the same accuracy and fastness at any time, even after a long period of continuous non-stop work.

7. Reduction in Manpower

Earlier, the work in industries/factories was done by a number of persons. But with computers, it can be completed by a few persons and that too more accurately and efficiently.

8. Paper Work can be reduced

The use of computer reduces the burden of paper work in any organization. *For example*, record of each student of a school can be kept in the computer itself rather than keeping manual files for each student.

Limitations of a Computer

computers do have the following limitations that are the strengths of human beings. These are:

1. No Decision-making Ability

2. No Intelligence

3. No Emotions and Feelings

2.5. Introduction to Data Representation

A digital computer works with binary number system. The binary number system has only two digits 0 and 1. Inside the computer, binary number is represented by an electrical pulse. 1 means a pulse of electricity and 0 means no pulse.

Data is divided into three types—alphabetic data, numeric data and alphanumeric data. Alphabetic data is used to represent the alphabets. It consists of capital letters A–Z, small letters a–z and blank space etc.

Computer Coding System

We are already familiar about different types of number systems. The computers convert the information, numeric or non-numeric, into binary form. Therefore, one must know how the data/information is stored in computer memory. Any data or information is represented internally using the bits 0 and 1.

A computer system's data/information storage capacity is represented by bytes, kilobytes, Megabytes, Gigabytes and Terabytes.

2.6. Classification of Computers

Computers can be classified into super computers, mainframe computers, minicomputers, and microcomputers (personal computers) on the basis of the following:

1. Size-either **large** or **small**

2. Cost- either **expensive** or **cheap**

3. Performance

(i) Speed of processing data- either **fast** or **slow**

(ii) Storage capacity- either **large capacity** or **small capacity**

(iii) Ability to handle input and output devices- either **single** or **many** users can use it at a time.

Let us classify the types of computers used today:

1. Microcomputers: Microcomputers are also called Personal Computers (PCs). These computers use microprocessors. They are small in size. Also, they do not have large storage capacities.

They can perform difficult tasks. These are smallest in size and capacity and are applicable for office, home and personal use. These are the most widely used type of computers for personal, home and office use, educational training in schools, and in small business enterprises.

The **classification** of PCs is as:

I. Desktops: The desktop computer's primary parts rest separately on top of desk. These primary parts are Keyboard, System unit and Monitor.

II. Portables: These PCs are so small that they can be placed on your lap. The difference between portables and desktops is that portables can be carried while travelling unlike desktops. The portables are classified:

(i) Laptops: These are small-sized machines that have the same power of a desktop. The weight of a laptop is around **7 to 12 kg**. The system case, monitor, keyboard, and all internal workings are all in one light, compact case.

(ii) Notebooks: These are smaller than a laptop and are designed to overcome the drawbacks of a laptop. They have the size of a notebook but are as powerful as a desktop. They weigh 3 to 4 kg.

(iii) **Palmtops or Personal Digital Assistants (PDAs)**: These are handheld computers which have the size of a pocket calculator. They are not as powerful as a desktop. PDAs combine personal organization tools — schedule planners, address books, to-do lists — with the ability in some cases to send e-mail.

2. **Minicomputers**: are larger in size and capacity than PCs. Minicomputers are small general-purpose computers, also called **midrange servers**. These computers can perform more complex tasks and cost more than microcomputers. They are popularly used in banks, universities and colleges.
3. **Main frame computers**: these types of computers process a vast amount of information and have much higher processing speed and capacity than the above two. They can be used in higher organizations like Ethiopian airlines designed for complex operations. The **main frame** is the workhorse of the business world. A main frame is the heart of a network of computers or terminals which allows hundreds of people to work at the same time on the same data. It requires a special environment - cold and dry
4. **Supercomputers**: are the most powerful computers, fastest, and the most expensive type of computers. An example can be computers in NASA & the Earth Simulator in Yokohama. The **supercomputer** is the top of the heap in power and expense. These are used for jobs that take massive amounts of calculating, like weather forecasting, engineering design and testing, serious decryption, economic forecasting. There are only a few super computers throughout the world.

2.7 Computer systems

A computer is not a single machine, but it is composed of components that can be classified as Computer hardware and Computer software.

Computer systems have two major components that can be classified as hardware and software.

Hardware is the equipment you use, part of computer you can touch and feel where as **software** is the set of instructions, called programs, that tells the computer hardware what, when and how to do tasks.

2.7.1 Computer Hardware

Computer hardware is the physical part of the computer that you can see and touch. It is composed of a number of interacting physical parts based on the need of the information flow. Four basic elements of the computer hardware are:

- | | |
|----------------------------------|----------------------------|
| 1) Input Devices | 3) Output devices |
| 2) Central Processing unit (CPU) | 4) Memory /Storage Devices |

2.7.1.1. Input Devices

A computer cannot use the data for processing unless it is translated in a language it understands. Input devices convert information from a form suitable to human beings to one understandable by the computer.

Input devices enable a computer user to enter data, commands, and programs into the computer and interact with computer. Different input devices handle different types of information. Examples: Keyboard, Mouse, microphone, scanners, Digital Camera, etc.

1. The Keyboard

One of the most common means of entering information into a microcomputer is through the **keyboard**. Styles may vary, but the basic components are standard for most keyboards.

keyboard helps to input **Text** to the computer system.

The standard keyboard has four groups of texts. The **alphanumeric keys** and the **numeric keys** enter text and number into the computer. The **function keys** are used by programs as keyboard shortcuts to commands. The **cursor-movement keys** allow you to move the cursor to various positions on the screen. The cursor is the point on the screen that is active, and where the information you enter will appear.

2. The Mouse

A mouse allows you to move the pointer or cursor that is on the screen and to select items by clicking on them. So it is called **pointing device**.

3. Microphone:

A multimedia PC converts **sounds and human voices** to computer information. A PC captures sound input through a microphone and gives the output through a speaker.

4. Scanner:

Scanners scan paper and photographic images and convert them to digital images. Photos scanned in are processed by PC software to enhance image quality. You can input signatures, pictures, finger prints to your PC. The scanner works like a copy machine. It captures a whole page and converts it to digital image. The scanned text cannot be edited at this point. In short, scanner changes any **hardcopy** in to **softcopy** medium convert into digital forms. So It can input **image(picture) & text** to the system.

5. Digital/Web Camera

Video cameras are used to **capture images** or continuous video streams for the PC. There are digital and photographic Cameras attached to your PC to create image and video files. A digital camera takes still photos but records the pictures on computer disks or memory chips. The information contained can be uploaded to a computer for viewing. Web camera- attached to a computer and used for video conferencing.

2.7.1.2. Central Processing Unit (CPU)

The most fundamental part of a motherboard is the microprocessor chip or the Central Processing Unit (CPU) integrated circuit of semiconductor devices and other electronic components manufactured on a thin sheet of semiconductor material.. The CPU is often referred to as the “**brain**” of the computer.

The **CPU**, or **Central Processing Unit**, is the main part of a computer in which all processing is carried out. This is the part of the computer that does the "thinking" and also named as “the brain of computer.” The CPU has two major functions:

- It co-ordinates and controls the computer’s activities. For example: retrieving/opening files from disks, interpreting data and commands entered from input devices like keyboard, and sending data to output devices like printer, etc.
- It performs arithmetic and logic operations using binary number system

CPU has three parts:

- A. **Arithmetic and Logic Unit (ALU):** The ALU is designed to perform basic arithmetic and logic operations.
 1. The arithmetic operations include addition(+), subtraction (-), multiplication (*) and division (/).

2. The logic operations include AND, OR, and NOT functions, $<$, $>$, $=$, $\neq$, $\leq$, $\geq$. The ALU can only do one thing at a time but can work very, very fast.

B. Control Unit (CU): The Control Unit is responsible for controlling the overall operation of the computer system. Its main operation is to fetch, interpret, and control the execution of program instructions stored in memory. In short, the control unit directs and co-ordinates all units of the computer.

C. Registers: in order to retain intermediary results, the ALU requires a provision for storing operand and instructions used for control unit. These storing devices within CPU are called registers. Registers have a very fast access time.

2.7.1.4. Storage Devices

Storage refers to the media and methods used to keep information available for later use. Some things will be needed right away while others won't be needed for extended periods of time. A computer has two types of storages; one that store data or instruction *currently* being processed (**main memory**) and the other store data or software that retain within computer for a long time (**auxiliary storage**).

A. Main Memory (Internal or primary memory)- includes **RAM and ROM**

Internally, temporary instructions or data can be stored in silicon Random Access Memory (RAM) chips that are mounted directly on the computer's main circuit board (motherboard). RAM is used to store-**Instructions, Data awaiting processing, Data currently being processed & Processed data output**

ROM (Read Only Memory)

- Unlike RAM it is non-volatile
- to store fixed start-up instructions

RAM (Random Access Memory)

is a volatile form of storage

its contents are temporary

RAM is said to be volatile—the contents are lost when the power goes off or is turned off the stored data to be accessed in any order, that is, at random.

B. Auxiliary Storage Devices (External or Secondary Storage Devices)

When you create data on the computer or write (load) programs, you cannot save them permanently in the computer's main memory. Primarily, main memory (RAM) is not large enough to store all of the programs and data that are used. In addition, main memory loses its data when the computer is turned off. For these reasons, the computer has another form of memory for permanent storage. This memory is known as **auxiliary storage** also called **external or secondary storage**.

Secondary storage devices consist of use **magnetic storage** media in the form of floppy disks, hard disks, flash disks or tapes and **optical storage** media like CD and DVD to store programs and data. Once data is stored on these storage media, it can be reloaded back into the computer's main memory without having to re-keyboard it.

Magnetic storage devices:

Magnetic storage devices are coated with tiny magnetically sensitive particles which record **binary** data. Common magnetic devices are floppy disks, hard disks, flash disks and magnetic tape. Each of these storage media can be erased and reused.

- i. **Hard disk** is a high storage capacity magnetic disk made up of metal which can be fixed in the system unit of the computer. The amount of data that storage device can contain or store is called **storage capacity**. Hard disk is not a single flexible disk, but a stack of metal disks sealed in a box. Accessing data from hard disk is faster than accessing data from floppy disks. **Hard disk** has the high storage capacity than any other storage devices it stores in **GB** or **TB**.
- ii. **Floppy disk** A floppy disk drive is a storage device that stores data on removable 3.5-inch-diameter. Each can store **1.44 MB** or more data
- iii. **Flash disk** is a type of data storage media integrated with a USB (universal serial bus) interface. USB flash drives are typically removable and rewritable, much shorter than a floppy disk. USB flash drives offer potential advantages over other portable storage devices, particularly the floppy disk. They are more **compact, faster, hold much more data, have a more durable design**, and are **more reliable** for lack of moving parts.
- iv) **Magnetic tape** reads and writes data in the same way an audiocassette tape-records and plays sound; with the exception that magnetic tape stores **digital data** (1s and 0s). Because a tape physically allows only **sequential** access, data retrieval can be slow and tedious;

i. **Optical Storage Devices**

Compact Disk (CD)

The compact disk or CD is an optical storage medium. It is relatively cheap and has a storage capacity of up to **700 Megabytes** of data. There are three main types of CDs: CD-ROM, CD-R & CD-RW

CD-ROM (Compact Disk—Read Only Memory. CD-R (Compact Disk-Recordable (iii) CD-RW (Compact Disk-Rewritable)

Digital Versatile Disk (DVD)

The digital versatile disk or digital video disk or DVD is an optical storage medium. It is a CD-style disk but is able to hold about 15 times as much information and transfer it to the computer about 20 times as fast as a CD-ROM. It has high capacity optical disk capable of storing **4.7 Gigabytes** to **17 Gigabytes**. There are three main types of DVDs: Just like the CD; DVDs are **DVD-ROM, DVD-R & DVD-RW**

2.7.1.3. **Output Devices**

An output device is a peripheral device that enables a computer to communicate (send out) information to the user. It receives information from a computer RAM and transforms it into human readable form (that the user can understand).

In general, there are three types of output from a computer. These are:

1. Printed or hard copy output

A. **Plotters**: devices that produce hard copy **graphical output** for engineering design, weather map .

B. **Printer**: Printers are devices for producing permanent output on paper.

So both **Printer** and **plotter** convert **softcopy** to **hardcopy**.

2. Display output or soft copy output

A. **Display screen or Monitor**. They are two types

CRT (Cathode Ray) Monitor- monitor with cathode tube in it.

LCD (Liquid Crystal Display) Monitor-monitor with liquid flat screen.

B.**LCD Projector**-displays output from the computer system in a **magnified** way.

3. Voice output:

A. **Headphones**- to listen sounds from the device for single person

B. **speakers**- to listen sound form device for many users at a time.

Printed or hard copy output, Display output or soft copy output & Voice output

2.7.2.Computer Software

Software or a program is a complete set of instructions written by humans, which enables the computer to obtain solution of a certain problem. Any program to be executed first it should reside / loaded/ in the memory. Software is a collection of programs and routines that support the operations of performing a task using a computer. Software also includes documentations, rules and operational procedures.

Software is often divided into two categories:

- **System software**:-includes the operating system and all utilities that enable the computer to functions.
- **Application software**:-includes programs that do real task for users.

The important categories of system software are:

A. Operating system & B. Language software

A. Operating system-The operating system coordinates the interaction between the user and the computer. The OS contains instructions that coordinate the overall activities of hardware device. It also contains instructions that allow you to run application software. Example: Windows-Xp, windows 7, windows 8, windows 10 etc.

B. Language Software

Used by programmers to develop application programs. Language software is a generic name consisting of various programs that serve as compilers and translators to develop programs in a number of different programming Languages. Example: C++, Visual Basic, COBOL, etc

2.2.2.1. Application Software

It is software that is designed to perform tasks for the **specific purpose**. Depending on their function or task they are categorized in to the following:

Word Processors (Microsoft word), Spreadsheet(Microsoft Excel),Presentation(MS power point)

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| <ul style="list-style-type: none">○ Do you understood the meaning computer?○ Have you Identified the hardware & software parts of computer?○ Do you know the Categories of computer?○ Have you identified the different generations of Computer? |
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