TOPIC: DATA PROCESSING

Definition of Data

Data are raw facts. They are figures, words and symbols that have not been processed or put into meaningful form. Data can be referred to as raw material from which information is produced. Data is the plural of datum.

Types of Data

1. Numeric data: Data consisting of digits and not letters of alphabets or special character. E.g. 0 – 9

2. Alphabetic data: Data consisting of letters and not digits or special characters. A-Z and a-z

3. Alpha-numeric data: Data consisting of digits, alphabets as well special characters. Ussm12, #,!,? 07/01/2019, etc.

Definition of Information

Information is processed data. Information is the result of processing, manipulating and organizing data in a way that adds to the knowledge of the person receiving it.

Data can be processed physically by human beings, example calculation such as addition, division, etc to give it more meaning. Data can also be processed using machines like calculators, computer, etc.

Definition of Data Processing

Data processing is a computer process that converts data into information.

Data Processing Cycle

Data processing cycle is the sequence of stages in processing data. The stages in data processing include:

1. Data gathering or collection
2. Data collation or preparation
3. Input stage
4. Processing stage
5. Storage stage
6. Output stage

Data Gathering: This is the process of collecting data together before processing.

 The methods of gathering data include:

a. Interview

b. Questionnaire

c. Record review

d. Observation

Before data are gathered the following must be taken into consideration:

i.   The types of data needed

ii. The scope of the data

iii.   Purpose of the data

iv.   Relevance of the data

v. The plan for gathering

vi.   The methods for data collection

Data Collation: Data collation is the assembly of data in standard order

Input Stage: At this stage data are entered into a device like calculator or computer for processing. In computer, data are entered via input devices such as, Keyboard, Mouse, Joy Stick, Light pen, Track Ball, Scanner, Graphic Tablet, Microphone, Magnetic Ink Card Reader (MICR), Optical Character Reader (OCR), Bar Code Reader, Optical Mark Reader (OMR),

Processing Stage: This is the stage whereby data are converted from raw form to information or a useable form. In computer, data are processed in the Central Processing Unit (CPU). The CPU is the brain of the computer. It serves as the main information processor in a computer.

Storage Stage: This is the stage where data are kept after processing. Processed data are stored in the main memory. The main memory is also known as primary or internal memory. There are basically two types of primary memory:

a. RAM (Random Access Memory)

b. ROM (Read Only Memory)

Output Stage: This is the last stage of data processing where the result gathered from processing the data is sent out for the user to see and use. Examples of output device include Monitor, Printer, Projector, Speaker, and Plotter. Output devices such as printers and monitors send the result on paper and screen respectively.

Importance of the Computer as a Tool for processing Data

Computers have an edge over other devices for data processing for data processing for its:

1. Increased Accuracy: Computer as a tool for processing data has the ability to perform rapid and accurate calculation. Computers don't make mistakes as human do except a wrong instruction is given.

2. Efficient Storage facilities: Computer storage is more efficient such that the quantity of data stored at any point can be accessed anytime. It is reliable in terms of storage

3. Fast Access to Information: Unlike searching for files in cabinets which takes longer time, computer has the ability to supply stored information quickly and easily.

4. <u>Handling Repetitive Tasks</u>: Computer can perform a single task repetitively without being tired unlike you and me.

5. The computers have the ability to work continuously and under conditions not suitable for human beings e.g. very cold or very hot environment.

Computer Ethics JSS One

Definition of Computer Ethics

Ethics is a set of moral principles that govern the behaviour of a group or individual. Computer ethics is a set of moral principles that regulate the use of computers.

Computer Room Management Ethics

A computer room must be managed properly. Unlike our homes we need to keep a computer room in a good condition always by:

1. Making it free of dust: we should endeavor to dust our computers every day after sweeping the room. After sometime, a computer engineer should use a blower to blow off dust from within the computer.

2. Maintaining appropriate lighting: a computer room must not be dark while computers are being used. Steady flow of electricity and a device called uninterruptible power supply (UPS) should be used. A UPS is a device used to store electricity for the computer in case of power failure.

3. Maintaining adequate and appropriate ventilation. A cooling system is very necessary all the time for our computers. Fans and

air conditioners should be used always to avoid computers being damaged because of heat.

4. Proper setup of computer system: all connections should be done before usage.

5. Eating and drinking should be avoided while in computer room.

6. Noise should be avoided in a computer room.

7. A maintenance officer should check all computers before and after use.

Laboratory Rules and Regulations

In a computer laboratory, certain rules and regulations should be observed. They include:

1. Chairs and tables should be arranged in a comfortable manner so as to ease movement within the computer laboratory.

2. Power points should be attached to the wall close to each computer.

3. The system unit and peripherals such as monitors, keyboard, mice etc should be arranged in an orderly manner.

4. A computer laboratory should be out of bound for non-computer users.

5. Computers should be booted properly before use and shut down properly after use to avoid damage to the memory files of the computer.

6. There should be no smoking, eating or drinking in the computer laboratory.

7. Keep the computer away from direct sunlight and sources of heat.

8. Be careful about using diskettes or external storage devices from unknown sources as the computer could easily get infected with a virus.

Historical Development of Computer

Introduction

We are living in the computer age. Most of our day to day jobs are being influenced by the use of computers. It is used increasingly in each and every field of our life. In the areas of science and technology improvements cannot be achieved without the use of computers. Hence it has become necessary to have basic knowledge about computers.

Strictly speaking, computer is a calculating device having certain important characteristics like speed, storage capacity, accuracy etc. But, nowadays it is used for many more applications other than computing.

History of Computer

The historical development of computer is divided in to several stages. These are:
1. Early Counting Devices
2. Mechanical Counting Devices
3. Electro-mechanical Counting Devices
4. Electronic Counting Devices

A. Early Counting Devices

Long ago, people used different and easily available and affordable counting methods such as fingers, toes, stones, sticks, pebbles, cowries, writing on the wall, etc to solve different counting needs. Some of these early counting devices are examined below.

1. Fingers and toes: The fingers and toes were used for counting, giving account of days and trading. The early man also used their feet to measure.

2. Pebbles and grains: pebbles are small round stones that were used for counting. Grains from the farm such as corn, beans and rice were also used for counting.

3. Cowries: These are the highly polished, usually brightly colored shell of small snail found in warm seas. They are used as money and for other counting needs.

4. Sticks: These include the canes, clubs and shaped woods that were used for measuring land area and for other counting and measuring needs.

5. Writing on the wall: In early ages, man learnt to use objects like charcoal, mud and limestone to write stroke on the wall for counting

Major Problems Associated with the use of Early Counting Devices

The major problems with these devices are:
a. They cannot be used for counting large numbers efficiently.
b. They also occupy large space.
c. They waste time.
d. They are not always accurate.
e. They are not always available

B. Mechanical Counting Devices

Mechanical devices are devices that involve the use of physical force to operate them. After it had been discovered that the earliest methods of counting were no longer convenient for counting large numbers, many mechanical devices were designed that aided people in their calculation. These include:

1. Abacus: Abacus is one of the first counting mechanical devices used for calculation. Abacus is a small device, it consist of beads strung on wire or wooden rod in a rectangular frame, which slides easily. The Chinese were the first to use abacus. It is used for addition and subtraction of numbers.

2. Slide Rule: In 1632, an English Mathematician, William Oughtred designed the first linear slide rule, although the familiar inner sliding rule was invented by an English instrument-maker, Robert Bissaker in 1654. However, the modern slide rule was made by Amedee Mannhein in 1859. Slide rule consist of a graduated scale, which can be moved relatively to aid simple calculation mechanically. In simple

slide rules, multiplication, division and finding of square root can be done.

C. Electro-Mechanical Counting Devices
Electro-mechanical counting devices are devices that use both the electronic and mechanical principles to perform the task of calculation. These include:
1. John Napier's Bone
2. Blaise Pascal Machine
3. Gottfried Leibniz, Machine
4. Joseph Jacquard's Loom
5. Charles Babbage's Analytical Machine
6. Philip Emeagwali

1. John Napier's Bone
In the early 1600s, a Scottish mathematician called John Napier invented a tool called Napier's Bone. It consist of eleven rods, with four sides each which was used as a multiplication tool.

2. Blaise Pascal Machine
Blaise Pascal a nineteen years old French mathematician invented a calculating machine in 1642 and named it Pascaline. He did that to aid his father who was a tax collector. It is used for addition and subtraction of up to 8 digits number.

3. Gottfried Leibniz's Machine
A German mathematician named Gottfried leibnitz in 1671 built a better machine that would save time. He called it Leibnitz's stepped Reckoner. The machine can add, subtract, multiply divide and calculate square root of numbers.

4. Joseph Jacquard's Loom
The Jacquard Loom was invented by invented by Joseph Marie Jacquard in 1801, which used punched cards to control weaving of patterns in fabric. Though the loom was not used in computation, it is considered an important step in the history of computing.

5. Charles Babbage's Analytical Engine

An English Mathematician Charles Babbage decided to build a machine that could perform difficult calculations accurately and more quickly than previous machines. In 1837, Charles Babbage designed the first programmable computer which he referred to as the analytical engine. According to Babbage's design, the analytical engine would be able to save instructions, perform calculation and produce the printed output. He is widely recognized as the father of modern computer.

6. Philip Emeagwali (Inventor of the World's Fastest Computer)

Philip Emeagwali, who has been called the "Bill Gates of Africa," was born in Nigeria in 1954. Like many African schoolchildren, he dropped out of school at age 14 because his father could not continue paying Emeagwali's school fees. However, his father continued teaching him at home, and everyday Emeagwali performed mental exercises such as solving 100 math problems in one hour. His father taught him until Philip "knew more than he did. In 1989 Emeagwali used 65,000 processors to invent the world's fastest computer, which performs computations at 3.1 billion calculations per second. His computers are currently being used to forecast the weather and to predict the likelihood and effects of future global warming.

D. Electronic Counting Device and Modern computer

Electronic devices are devices that function using electronic principles. After electro-mechanical devices, the electronic devices took the centre stage. These devices include:

1. Herman Hollerith's machine
2. John Von Neumann Machine
3. Electronic Numerical Integrator and Calculator (ENIAC)
4. Mini Computers
5. Micro Computers
6. Personal Computer

1. Herman Hollerith's machine

Herman Hollerith's machine was developed in the late 19th century by an American called Herman Hollerith. This machine was used to process census information in the U.S.A in 1890. Hollerith formed a company to sell his machine but later merged with other companies to form the popular IBM (International Business Machine) Computer which is the largest computer manufacturing company today

2. John Von Neumann Machine

In 1945, a mathematician, John von Neumann developed the stored program concept in which program could be read into computer memory for processing.
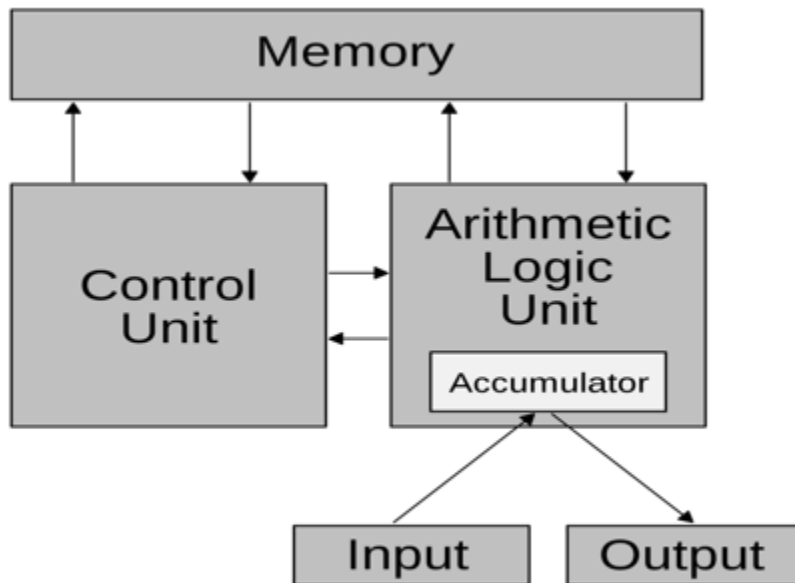
3. ENIAC

This means Electronic numerical integrator and calculator. ENIAC was built at the University of Pennsylvania between 1943 and 1945 by two professors John Mauchly and prosper Eckert. ENIAC filled a 20 by 40 foot room, weighed 30 tons, and used more than 18,000 vacuum tubes generated waste heat like a light bulb and all this heat (174,000 watts of heat) meant that the computer could only be operated in a specially designed room with its own heavy duty air conditioning system.

Note:

Other computing devices invented by John Mauchly and prosper Eckert are

i. UNIVAC (Universal Automatic Computer)

ii. EDVAC (Electronic Discrete Variable Automatic Computer)

APPLICATION OF ICT IN EVERY DAY LIFE

Meaning of ICT
ICT is an acronym that stands for Information and Communication Technology. ICT refers to technologies that provide access to information through telecommunications. Information and Communication Technology deals with the use of diverse technological tools and resources to convert, store, protect, process, transmit and retrieve information. It comprises of computers, networks, satellite communications, robots, videotext, cable television, electronic mail, electronic games and automated office equipment.

Uses of ICT
The three main uses of ICT include the following:

1. Communication
Information can be transmitted from one place to the other with the use of ICT. For example sending and receiving e-mail messages, making phone calls, audio and video conferencing, sending and receiving fax messages, chatting and instant messages etc.

2. Information Processing and Management
It can be used in storing, retrieving and manipulating data and information, typing of letters, notes and other documents, keeping records of inventory, transmitting information etc.

3. Timing and Control
It can be used in manipulating and controlling equipment used in aircraft, ships, oil rings, automated teller machine (ATM), and scientific research. It can also be used in monitoring and reporting on status of equipment etc.

ICT and Society
Today, almost the whole world depends on ICT. There is no organization that cannot do without information technology. Learning institutions, industries, banks, hospitals, supermarkets etc all depends on daily information in carrying out their daily activities. ICT has led to development of so many things and reduced the world to global village.

ICT and Development of society

The impacts of ICT in the society include:

(a). Education
ICT is been used in schools by students and teachers in searching for knowledge and educative materials.

(b). Commerce
The ICT has brought about the easiest way of buying and selling of goods on internet which is called e-commerce (Electronic Commerce). In e-commerce, the prospective buyer will book or register for the needed goods or services which will be delivered to them within a stipulated time.

(c). Communication
ICT has been the major part of communication, the use of internet, video conferencing; one can communicate with other people outside ones country.

(d). Banking
ICT has made all banks to go online i.e. have internet access in their branches which makes their transactions easier. The use of Automated Teller Machine (ATM) is connected to the internet which pays money to different banks customers.

(e). Manufacturing
ICT is used in almost all manufacturing companies e.g. Textile industry, AutoCAD in engineering etc. this makes it so simple for industries/factories to produce many things within few minutes or hours since everything has been programmed.

(f). Libraries
Almost all libraries are now using information and communication technology (ICT) one can log books in and out.

Information Transmission

Definition of Information Transmission
Information Transmission is the process of sending out processed data from one person or place to another in a meaningful form through a communication medium. Human beings have been transmitting information since ancient times thus there are both ancient and modern means of transmitting information.

<u>**Ancient Methods of Transmitting Information**</u>
These are the methods used by our forefathers. They include the following:
a. Oral (Face to Face) Communication
This is a method whereby the sender (informant) meets with the receiver (recipient) face to face in order to pass information across.

b. Beating Drums
Drum beating is another way of transmitting information from the sender to the receiver. Drums are used to inform the Villagers of certain invents such as hunting, farming, death announcement e.t.c. Every event has its unique tune that the villagers can understand.

c. Smoke Signals
This method is used to pass information by bush burning to alert the people in the environment of the incoming danger.

d. Making representation
Information could be sent from one village to another with the use of representation. E.g. tying a cutlass with red cloth which will inform the receiver that something bad is coming, if proper attention is not taken.

e. Town Crier
Information was passed by town crier shouting the information repeatedly around the town.

f. Drawing diagrams

The diagram will be drawn on the walls or on the banks of trees. The messages are always understood by the person it was made for.

Modern Methods of Transmitting Information

With the development in technology, it is now possible to pass information straight to the audience. Ancient means of communication have been replaced by more efficient modern ones. Modern means of transmitting information include:

a. Writing

Instead of making marks or using objects to communicate, in modern times, information can be transmitted by writing, which is done either by hand, or by using machines such as computers or typewriters.

b. Printing Machine

Printed materials are just like typewritten ones. Printing allows mass production of informative materials that could be spread far and wide e.g. production of invitation cards, handbills newspapers etc.

c. Radio

Voice information is broadcast to group of people in geographical location at the same time within few minutes.

d. Television

This is used to broadcast information in form of both voice and pictures to people in different location.

e. Internet

This means international network, information in this case is globally broadcast to the whole world for those that have interest in updating themselves.

f. Fax

This transmit text and graphic messages from one location to the other, it might be within the country or outside the country with the use of series of numbers called fax number.

g. Telephone

Telephone allows people's voices to be transmitted over long or short distances.

h. Telex

A telex machine is used to transmit textual information from one person to another usually over a long distance.

i. Satellite

A satellite is an object which has been placed into the orbit by human endeavor in other to improve sending radio, telephone and internet signals to any part of the world. Such objects are sometimes called artificial satellite to distinguish from natural satellite such as moon.

j. GSM

GSM means Global System for Mobile Communication. We use this to send and receive phone calls. One benefit of GSM phone is the addition of SIM card or Subscriber Identification Module.

Classification of means of transmitting information

Both ancient and the modern means of transmitting information can be classified under Electronic and Non-Electronic. Those that involve the use of electronics include prints, telephone, Radio, Television, Fax, Satellite, Internet and GSM.

Those that do not involves the use of electronic include Oral, Beating of drums, Fire lighting, whistling, drawing diagrams and making representation

Modes of Receiving Information

Messages can be received by three major ways. These include:

i. Audio
ii. Visual
iii. Audio-visual

Audio: This is a mode of communication where data are received

via sound or voice without seeing the pictures. E.g. through Radio, Telephone, Beating of drums, Town crying (except the town crier is closer) etc

Visual: This is a mode of receiving information through prints or pictures alone without sound or voice e.g. prints, Drawings, Computer printers, Telex, fax machines etc

Audio-visual: This is a mode of receiving information in both visual and audio form; i.e. both hearing sound and voice, and seeing pictures. E.g. Television, Oral, etc.

Generations of Computer

Generations of Computers

The development of electronic computers can be divided into five generations depending upon the technologies used. The following are the five generations of computers.

First Generation of Computers (1942-1955)

The beginning of commercial computer age is from UNIVAC (Universal Automatic Computer). It was developed by two scientists Mauchly and Echert at the Census Department of United States in 1947. The first generation computers were used during 1942-1955. They were based on vacuum tubes Examples of first generation computers are ENIVAC and UNIVAC-1.

Advantages

1. Vacuum tubes were the only electronic component available during those days.
2. Vacuum tube technology made possible to make electronic digital computers.

3. These computers could calculate data in millisecond.

Disadvantages

1. The computers were very large in size.

2. They consumed a large amount of energy.

3. They heated very soon due to thousands of vacuum tubes.

4. They were not very reliable.

5. Air conditioning was required.

6. Constant maintenance was required.

7. Non-portable.

8. Costly commercial production.

9. Limited commercial use.

10.   Very slow speed.

11.   Limited programming capabilities.

12.   Used machine language only.

13.   Used magnetic drums which provide very less data storage.

14.   Used punch cards for input.

15.   Not versatile and very faulty.

Second Generation Computers (1955-1964)

The second generation computers used transistors. The scientists at Bell laboratories developed transistor in 1947. These scientists include John Barden, William Brattain and William Shockley. The size of the computers was decreased by replacing vacuum tubes with transistors. The examples of second generation computers are IBM 7094 series, IBM 1400 series and CDC 164 etc.

Advantages

1. Smaller in size as compared to the first generation computers.
2. The 2nd generation Computers were more reliable

3. Used less energy and were not heated.

4. Wider commercial use

5. Better portability as compared to the first generation computers.

6. Better speed and could calculate data in microseconds

7. Used faster peripherals like tape drives, magnetic disks, printer etc.

8. Used Assembly language instead of Machine language.

9. Accuracy improved.

Disadvantages

1. Cooling system was required

2. Constant maintenance was required

3. Commercial production was difficult

4. Only used for specific purposes

5. Costly and not versatile

6. Punch cards were used for input.

Third Generation Computers (1964-1975)

The **Third generation computers** used the Integrated Circuit (IC). Jack Kilby developed the concept of integrated circuit in 1958. It was

an important invention in the computer field. The first IC was invented and used in 1961. A single IC chip may contain thousands of transistors. The computer became smaller in size, faster, more reliable and less expensive. The examples of third generation computers are IBM 370, IBM System/360, UNIVAC 1108 and UNIVAC AC 9000 etc.

Advantages

1. Smaller in size as compared to previous generations.
2. More reliable.
3. Used less energy
4. Produced less heat as compared to the previous two generations of computers.
5. Better speed and could calculate data in nanoseconds.
6. Used fan for heat discharge to prevent damage.
7. Maintenance cost was low because hardware failure is rear.
8. Totally general purpose

9. Could be used for high-level languages.

10. Good storage

11. Versatile to an extent

12. Less expensive

13. Better accuracy

14. Commercial production increased.

15. Used mouse and keyboard for input.

Disadvantages

1. Air conditioning was required.
2. Highly sophisticated technology required for the manufacturing of IC chips.

Fourth Generation Computers (1975-Present)

The fourth generation computers started with the invention of Microprocessor. The Microprocessor contains thousands of ICs. Ted Hoff produced the first microprocessor in 1971 for Intel. It was known

as Intel 4004. The technology of integrated circuits improved rapidly. The LSI (Large Scale Integration) circuit and VLSI (Very Large Scale Integration) circuit was designed. It greatly reduced the size of computer. The size of modern Microprocessors is usually one square inch. It can contain millions of electronic circuits. The examples of fourth generation computers are Apple Macintosh & IBM PC.

Advantages

1. More powerful and reliable than previous generations.

2. Small in size

3. Fast processing power with less power consumption

4. Fan for heat discharging and thus to keep cold.

5. No air conditioning required.

6. Totally general purpose

7. Commercial production

8. Less need of repair.

9. Cheapest among all generations

10.   All types of High level languages can be used in this type of computers

Disadvantages

1. The latest technology is required for manufacturing of Microprocessors.

Fifth Generation Computers (Present & Beyond)

Scientists are working hard on the 5th generation computers with quite a few breakthroughs. It is based on the technique of Artificial Intelligence (AI) or Biochip. Computers can understand spoken words, imitate human reasoning and respond to its surroundings using different types of sensors. Scientists are constantly working to increase the processing power of computers. They are trying to create a computer with real IQ with the help of advanced programming and technologies. IBM Watson computer is one example that outsmarts Harvard University Students. The advancement in modern technologies will revolutionize the computer in future.