

01 - Explores the basic concepts of ICT together with its role and applicability in today's knowledge-based society

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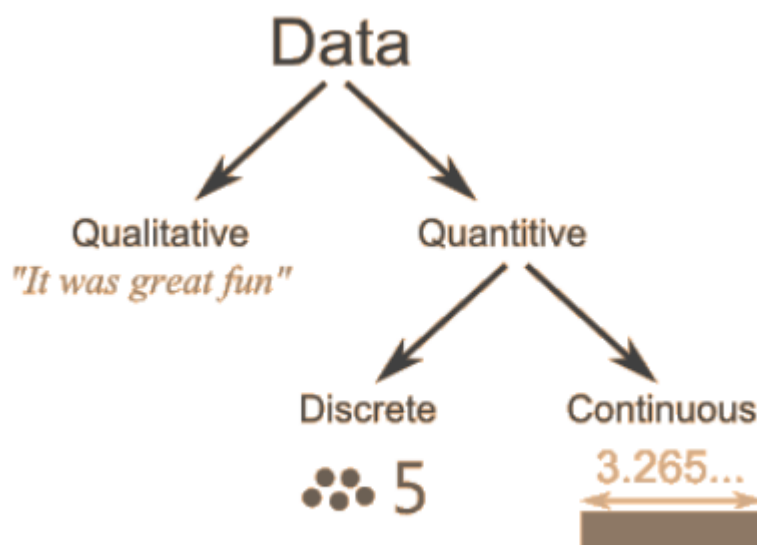
Data

Data is a raw and unorganized fact which input into the system in order to process to make it meaningful information. (numbers, words, sounds)

- Data is always interpreted
- Always an input

Two types of data

1. Quantitative data - information that can be measured or counted and written down with numbers
 - Discrete data - with only integer values
 - Continuous data - information that can't actually be measured but can identify as properties of something
2. Qualitative data - information that can't actually be measured but can identify as properties of something



Life cycle of data

1. Data creation - New data should be introduced to the system or created inside itself
2. Management - Keeping data securely and making them accessible

3. Removal of obsolete data - outdated and found to be unnecessary anymore, it's the time to remove that data from the system

Data Processing Life cycle

1. Data gathering
2. Data Validation
3. Data Processing
4. Generating Output
5. Data Storage

Information

Set of data created by processing data to a requirement in a meaningful manner that it can be used to make decisions.

- Information can be output of a process while it can be input to another process.
- Can be either an input or an output.

Information = Data + Context + Meaning

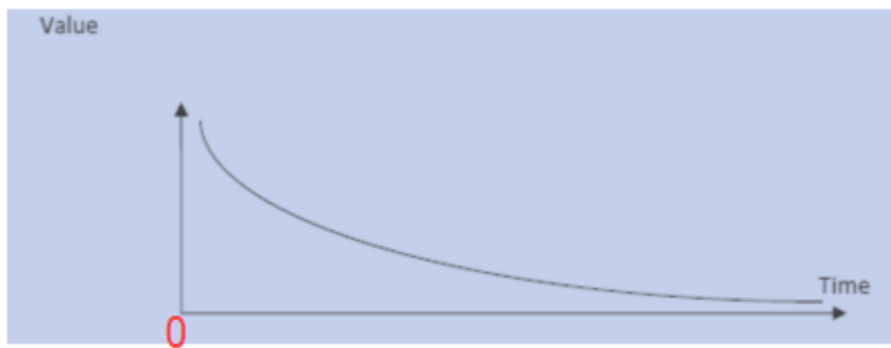
Data	28101955	This has no meaning or context
Context	It is a British date	This allows us to register it as 28 th October 1955. It still has no meaning and therefore not Information.
Meaning	The Birth Date of Bill Gates	This gives us all elements required for it to be called "Information"

Value of information

Valuable information should have characteristics such as,

- Relevance - dependent of a particular person
- Timeliness - should be updated
- Accuracy - to get correct decisions
- Completeness - not sufficient to make decisions
- Understandability - should be clear

The golden rule of information - Value of information decreases with the time.



Big Data Analysis

- What is Big data

Massive amount of data collected from different sources that can't be maintained in a usual management method

Examples

- Sources - images, videos, social media.
- Environments and technologies - NoSQL, Hadoop, MapReduce

Properties of big data (4v)

- Volume
- Variety
- Velocity
- Veracity

Applicability of information in day to day life

- Decision-making
- Policymaking
- Prediction
- Planning

Pitfalls of manual data processing

- Consume more time.
- Human errors.
- Inefficient (when providing and sharing)
- Inability to provide a quality service.
- Data inconsistency - same data in two sources in different manner (kavi, Kavi)

Automatic data processing.

Utilizing technology to store, process and retrieve data.

- Human attraction is less, therefore job opportunities get lowered.

02 - Investigates the need of technology to create, disseminate and manage data and information

Investigates the need of technology to create, disseminate and manage data and information

Formulates an abstract model of Information

System

Collection of inter-related components working together to fulfill a specific task.

Abstract model of information

In an information system, data is input into a system and information is produced as output using the processing instructions from the user.



Abstract Model of Information

Digital computer

A computer is an electronic device, operating under the control of instructions stored in its own memory unit, which can accept and store data, perform arithmetic and logical operations on that data without human interactions to produce output.

Functions of digital computer

1. Takes data as input
2. Stores data
3. Processes data and converts into information
4. Generates output
5. Controls all the above 4 steps

Computer follows the abstract model, therefore it's a system

Advantages of computer

1. High speed
2. Reliability
3. Versatility

4. Automation
5. Accuracy
6. Reduction of paper-work, cost

Disadvantages of computer

1. Dependent
2. No IQ

03 - Formulates an Abstract model of information creation and evaluates its compliance with ICT

Formulates an Abstract model of information creation and evaluates its compliance with ICT Tim

Emergence of ICT Era

Information and communication era - after 1950

- Technologies improved with this era - Internet, WWW, mobile communication, cloud computing, mobile computing

Internet and WWW

Internet:

- Network of networks connected through all over the globe
- launched in 1969
- in USA
- called **Advanced Research Project Agency Network** (ARPANET)
- to communicate between 2 camps of USA defense ministry.

Internet was launched first and before WWW

WWW:

- launched in 1991(1989)
- by Tim Barnes Lee (director of World Wide Web Consortium) <- W3C
- W3C creates the standards for WWW
- prior to WWW, all were text and no graphics
- consists of different generations

Web generations

Web 1.0 - linked different information, search engine.

Web 2.0 - in 2001, social media (FB), more dynamic content.

Web 3.0 - current generation, automatically prepares information, personalization (AI)

Services of WWW

- Communication.
- Searching for information quickly.
- Education through Internet (E-learning)
- Shopping.
- Entertainment.

Mobile computing and communication

Transmission of information over a distance without the help of wires or any other electrical conductor

Firstly, communication between 2 parties were invented. Later, communication between multiple parties were invented using TDMA, CDMA, FDMA like systems

(In here CDMA uses a **common channel** to for sharing while FDMA doesn't

Mobile computing - PC, Laptop

Mobile communication - mobile phones

Cloud computing

The delivery of computing services, resource and environments over the internet

1. Infrastructure as a Service (IaaS)
 - Access to fundamental resources
 - Virtual desktop environments, Games, Cloud storage
2. Platform as a Service (PaaS)
 - Providing a run time environment
 - Web server, Database servers
3. Software as a service (SaaS)
 - Providing usability to software programs
 - Google Docs

Benefits of cloud computing

1. Flexibility
2. Better operational control
3. Automated processes
4. Continues information access

04 - Classifies the basic components of a computer

Classifies the basic components of a computer

Basic components of a computer system

1. Hardware - collection of physical parts of the computer

2. Software - set of programs which is designed to perform a well-defined functions.
3. Firmware - Boot up instructions stored in the ROM
4. Liveware - User

Hardware

1. Input devices
 - MICR - used in banks to read cheques
 - OCR - to read a printed text (edit PDFs)
 - OMR - used for checking the answer sheets of examinations having multiple choice questions
2. Output devices
 - Monitors/ Visual Display Unit (VDU), are the main output device of a computer
 - CRT - made up of small picture elements called pixels
 - Flat-Panel
 - Emissive Displays - convert electrical energy into light (plasma panel)
 - Non-emissive Displays - use optical effects to convert sunlight or light from some other source into graphics patterns
 - Printers
 - Impact
 - 2 types as **Character printers** and **Line printers**
 - Features
 - Very low consumable costs
 - Very noisy
 - Useful for bulk printing due to low cost
 - There is physical contact with the paper to produce an image
 - Examples:
 - Dot matrix - printing character by character
 - Non-Impact
 - 2 types as **Laser Printers**, **Ink jet Printers**
 - Features
 - Faster than impact printers
 - They are not noisy
 - High quality
 - Supports many fonts and different character size
 - Laser printers use a powder stored in a **toner** while inkjet printers use a liquid ink stored in a **cartridge**
 - Examples
 - Thermal printer- printed by heating coated thermo chromic paper
 - 3. Processing devices
 - CPU - for arithmetic and logical processing
 - Features
 - Brain of the computer
 - Performs all types of data processing

- stores data, results, instructions
 - controls all parts
 - includes memory registers
 - 3 components
 - Storage unit (Registers)
 - Control unit
 - ALU (Arithmetic and Logical Unit)
 - GPU - for graphic processing
 - used in personal computers, gaming consoles, workstations
4. Network devices
 - NIC - to connect to a network
 - Internal cards
 - External cards
 - 2 types as USB and Wireless
 - Router
 - Switch
 5. Memory devices
 - Used to store data and instructions
 1. Primary memory (RAM/cache)
 - **Memory that can be accessed directly by the CPU**
 - Volatile (memory is gone after turning off the device)
 2. Cache memory
 - High speed, semiconductor
 - acts as a buffer between the CPU and the main memory
 - (Also a part of primary memory)
 3. Secondary memory
 - slower than the main memory
 - external memory or non-volatile
 - contents of secondary memories are first transferred to the main memory, and then the CPU can access it

Software

There are 2 types of software

1. System software
 2. Application software
- System software

To operate and control the computer hardware and to provide a platform for running application software

1. Operating systems - Windows, Linux
 2. Utility software - AV, Disk cleanup
 3. Language translators - Compiler, Interpreter, Assembler
- Application software

Softwares are also divided as,

1. Open Source Software
 - source code is available and it is free to use, modify or redistribute these type of software
2. Proprietary Software
 - source code is not available and user should have the permission given by owner of the software to use this type of software.

Firmware

Firmware is a computer program that is embedded in a hardware device, that is, an essential part of the hardware

Firmware is stored in ROM to handle the booting process

Liveware

Liveware refers to computer users

05 - Analyses the activities of data processing

Analyses the activities of data processing

Modes of data input

- Direct and remote
 - In direct data input, data is input into the system directly without direct user interference. In remote entry, system is designed specially to store data. Data storing and transactions are taking place in different geographical places.
- Online and offline
 - In online data input, the data is input at the same time transaction taking place, where data of different transactions input after a specific time period as a batch in offline method.

06 - Investigates the application of ICT in different domains

Investigates the application of ICT in different domains

ICT in Education

1. Simulations

2. Distance learning and E-learning
3. Better Content Delivery
4. Individualized learning

Health sector

- Electrocardiogram (ECG), Electroencephalograph (EEG), ultrasounds and Computed tomography (CT) scans are done by computerized machines.
1. Diagnostic System - Computers are used to collect data and identify the cause of illness.
 2. Lab-diagnostic System - All tests can be done, and the reports are prepared by computer.
 3. Pharmacy Information System - Computer is used to check drug labels, expiry dates, harmful side effects, etc
 4. Surgery - Nowadays, computers are also used as a supporting tool for surgery

Agriculture

Automatic weed removers and insect control devices protect the crop from weed plants and insects, respectively. Monitoring devices are used to monitor factors that affect crop production such as weather, climatic changes, rainfall, wind direction, soil fertility and water content.

1. Radio Frequency Identification Device (RFID) - counting the number of animals in farmhouses
2. Automated milking and examination

Business and finance

High speed of calculation, diligence, accuracy, reliability, or versatility like features of ICT devices are used.

Engineering

1. CAD (Computer Aided Design) - creation and modification of drawing.
2. 3D virtualization
3. Computer Aided Software Engineering tools (CASE) - designing, coding, testing and debugging of software

Social and economic benefits of ICT

ICT has the potential to affect many aspects of economic and societal activities such as Gross domestic product (GDP) growth, employment, productivity, poverty alleviation, quality of life, education, and healthcare.

Evaluates the impact of ICT in the society

Social, economic, environmental, ethical, legal and privacy issues caused by ICT

Social

- Time wastage
- Digital divide - difference between those who can access information and those who cannot, reducing levels of education and understanding

Access to appropriate technological resources similar and improvements in ICT education will help to overcome digital divide.

Health

- Eye strains - tiredness of eyes
- Back pain, neck pain
- CTS (Carpel tunnel syndrome) - pain in the fingers due to pressure in wrist
- Headaches
- CVS (Computer Vision Syndrome) - irritation of eyes
- RSI (Repetitive stress injury) - pain in shoulders and finger

Economic

- Job losses

E-waste

The major problem with e-waste is that the toxic chemicals such as lead, arsenic and cadmium can leach into the soil over time and contaminate the drinking water.

Green computing, the study and practice of efficient and eco-friendly computing resource in computing.