

Basic Concepts of ICT with its Role & Applicability

Life Cycle of data

Information is the main source used in the decision making process. Good decisions can be made with only good information (correct information).

To generate information we need data.

Data is the primary raw material to make information which is required in decision making. So Data is the key component to make information which can be helpful to us to make decisions. Because of that every business, organizations, welfare organizations and even governments are trying to collect data. Data is scattered. So we need to collect data and maintain it.

Life Cycle of data Steps

1. Data Creation

The first step of the data life cycle is the creation and capture of data. There are 3 ways organisations perform to do it.

- Data Acquisition : Acquiring already existing data which has been produced outside the organisation.

Ex: marketing company purchasing a mailing list from a third-party vendor.

- Data Entry : Employees in the organizations manually entering data into the system.
- Data Capture : Capturing data from the devices.

Ex: Temperature Sensor: It captures the current temperature in the room.

2. Management

Data Management includes a set of administrative tasks such as validating data, storing data, and protecting data.

Keeping data securely and making them accessible for users are some other tasks carried out in management of data.

Ex: A retail company manages data by using a secure database to store customer purchases, validating the information to ensure accuracy, and controlling who can access it to protect customer privacy.

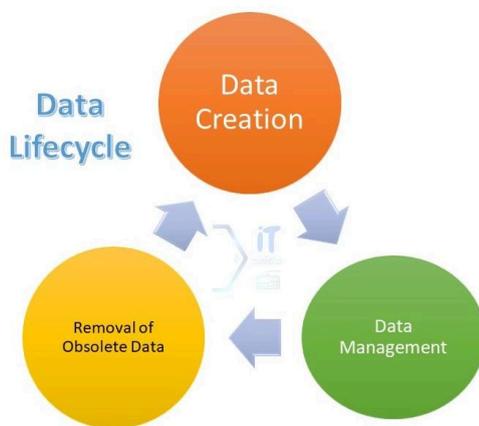
(Like CARNAGE)

3. Removal of obsolete data

The value of data depends on the time period it is used. Data can be used only if it has the ability to be used to generate information.

Therefore the period of the data is decided according to the requirement of the relevant institution. **The data that are not necessary for the present (outdated) are called obsolete data.** These data need to be removed from information systems without maintaining further.

Ex: A retail company removing customer purchase records that are more than seven years old, as they are no longer needed for financial reporting or customer analysis and are a potential privacy liability.



Quick Note ⚡

The data life cycle describes the journey of data from its creation to its end. It begins with **Data Creation** or acquisition, where data is generated or collected from various sources. This is followed by **Data Management**, which includes administrative tasks like validating, storing, and protecting the data to ensure it remains accurate, secure, and accessible. The cycle concludes with the **Removal of Obsolete Data**, where old, unnecessary information is securely deleted to save resources and reduce liabilities, as its value has diminished

over time.

Quick Revise

Select these statements are True or False.

1. Data is the final product used for decision-making. (True / False).
2. Data Acquisition is when an organization creates its own data internally. (True / False).
3. Data Management includes tasks such as validating and protecting data. (True / False).
4. Obsolete data has a high value, should be maintained in information systems. (True / False).
5. A temperature sensor is an example of Data Entry. (True / False).

Data Vs. Information

What is Data?

Data can be identified as follows....

- Numbers, images, letters, arts and sounds that have not been prepared in any manner are called data.
- When things get individually, those that are meaningless are called data.
- Things by which conclusions cannot be made are called data.
- Data are raw materials used to prepare information.

Ex: Letters, Numbers, Pictures, Sounds, Shapes,

Quick Note 

Data are a collection of **facts, figures, or symbols** that can be processed to create meaningful information. The word "data" comes from the Latin word *datum*, meaning **"something given."** In its raw form, data lacks context and can seem disorganized. However, once organized and analyzed, it becomes a crucial tool for making informed decisions, solving problems, and driving innovation.

Categorization Of Data

Data can be categorized in several ways, but the most common classification is by its nature.

There are 2 types of data.

1. Quantitative Data

Quantitative data is about **quantities**. It's expressed in numbers and is ideal for mathematical analysis. It's objective and precise, making it useful for statistical research and drawing conclusions that can be generalized to larger populations. There are several characteristics of Quantitative data.

- Can be subjected to an arithmetical process such as addition, subtraction, multiplication and division.
- Can be sorted or arranged in a numerical order.
- Ability to display the numbers scientifically.
- Can be presented using numbers,

Ex: mass, length, time, height

2. Qualitative Data

Qualitative data is about **qualities**. It's descriptive and expressed in words or labels, providing a deeper understanding of a topic.

It's subjective and observational, often used to explore concepts and experiences. Those cannot be computed.

Ex: images, symbols, documents

Quick Note 

Most of the time we are using quantitative data for our data processing tasks.

Characteristics of Data

Data has some characteristics.

- Data will be able to be collected and stored inside the book or computer related devices.
- Can be carried from one place to another place using a communication system.
- Data can be processed.

Definition of information

Information is data that has been processed by a computer into a form that is useful and meaningful to humans or systems.

Information obtained after processing data. Information is meaningful and can be used for decision making.

Ex: A student database stores raw data (names, marks), but when it shows "Top 5 students by average score," that is **information**.

Data

- Raw facts and figures.
- Has no context or meaning on its own.
- Can be numbers, text, images, sounds, etc.
- Stored in databases, files, or memory.
- Input for processing.

Information

- Processed or organized data.
- Has meaning in context.

- Useful for decision making.
- Presented in reports, charts, and summaries.
- Output of processing.

How to convert data into information

The process of converting data into information is called processing of data.



Data Processing Methods.

1. Manual Data Processing
 - Data that is processed **without using machines or computers** is called **Manual Data Processing**.
 - All tasks are done by **humans** using tools like pen, paper, files, or calculators.
 - It is the **oldest method of data processing**.
 - Data is transferred manually from one place to another.
 - Still some organizations use manual data processing methods.

Ex: A teacher manually marking exam papers and calculating totals on paper, A shopkeeper writing sales records in a notebook and calculating daily profit by hand, Banks in the past maintaining ledger books for transactions.

Key features of Manual Data

- Involves **human effort**.
- Requires **more time and labor**.
- Accuracy depends on the person handling it.
- Useful only for **small amounts of data**.

Advantages of Manual Data Processing

- **Low cost** – no need for computers or expensive software.

- **Simple to use** – just pen, paper, or basic calculators.
- **No electricity required** – can be done anywhere.
- **Good for small data** – useful when dealing with a small amount of information.
- **Human judgment** – people can apply reasoning and common sense (which computers can't).

Disadvantages of Manual Data Processing

- **Time-consuming** – takes a lot of time for calculations and record-keeping.
- **Prone to errors** – mistakes are common (miscalculations, wrong entries).
- **Difficult to update** – changing or correcting data is not easy.
- **Hard to store and retrieve** – paper records take up space and are not easily searchable.
- **Limited security** – paper files can be lost, stolen, or damaged (fire, water, etc.).
- **Not efficient for large data** – cannot handle big volumes of information.

2. Mechanical Data Processing

- Data is processed **using mechanical devices or machines**, but **without electronic computers**.
- Machines are used to assist humans in calculations, sorting, and recording.
- Faster and more accurate than **manual processing**, but slower than **electronic processing**.
- Relies on **mechanical or electromechanical tools** like typewriters, calculators, or punch-card machines.

Ex: **Typewriters** for preparing documents and records, **Punch card machines** (used in early banks, industries, and census operations), **Mechanical tabulators** used before modern computers.

3. Electronic Data Processing (EDP)

- Data is processed **using electronic devices such as computers**.
- Uses **software and hardware** to handle large volumes of data quickly and accurately.
- The most **common and widely used method today**.
- Data is input → processed by computer → stored → output as information.

Ex: ATM transactions in banks, Online shopping systems (Amazon, eBay), School/university databases for student records, Payroll systems that calculate salaries automatically, Hospital patient management systems.

👉 In short: Electronic Data Processing = Computers + Software → Fast, accurate, efficient, and reliable.

Advantages of Electronic Data Processing

- **Speed** – computers can process large volumes of data within seconds.
- **Accuracy** – reduces human errors in calculations and data handling.
- **Storage** – huge amounts of data can be stored in a small space.
- **Easy to update** – data can be quickly modified, corrected, or deleted.
- **Automation** – once set up, tasks can run automatically without much human effort.
- **Data security** – electronic systems allow passwords, encryption, and backups.
- **Search and retrieval** – information can be found instantly using queries.
- **Cost-effective in long run** – saves time, labor, and reduces paperwork.
- **Scalability** – can handle both small and very large amounts of data efficiently.
- **Decision-making support** – processed information can be used for reports, graphs, and analysis.

👉 Summary:

Electronic Data Processing = **Fast + Accurate + Reliable + Efficient**, making it the best method for modern organizations.

Characteristics of Information

Good information is that which is useful and which has value. Experience and research shows that good information has a number of qualities. Good information is relevant for its purpose, sufficiently accurate for its purpose, complete enough for the problem, reliable and targeted to right person,

These are the characteristics related to organizational information for decision making as follows.

Availability (Accessibility)

- Information should be easy to get when it is needed.
- If information is hard to find or locked away, it becomes useless for decision-making.

- Information systems should allow authorized people (only the right users) to access it anytime.
- Example: Students must be able to log into the school system to view their exam results without waiting for days.

Accuracy

- Information must be correct, exact, and free from errors.
- Wrong information can cause serious problems and wrong decisions.
- Accuracy means data is entered properly and calculations are correct.
- Example: If a bank account balance shows more money than you actually have, you may spend extra and face penalties later.

Reliability

- Reliable information comes from a trusted source and can be depended on.
- It should be consistent and not change unnecessarily.
- Reliability is important because decision-makers must be confident that the information is true.
- Example: A hospital's medical system must always give correct patient details to doctors, otherwise treatment may go wrong.

Relevance

- Information should be related to the purpose for which it is needed.
- Irrelevant information only wastes time and may confuse the person using it.
- Good information focuses only on what is useful for the task.
- Example: A school principal wants exam results of students, not details about what they ate for lunch.

Completeness

- Information must be full and contain all the necessary parts.
- If information is incomplete, decisions may be wrong or unfair.
- Example: A student's report card must show marks for *all subjects*. If only some subjects are shown, it is incomplete and misleading.

Level of Detail / Conciseness

- Information should have the right amount of detail depending on the user.
- Too much detail makes it difficult to understand, while too little makes it unclear.
- Conciseness means giving only the necessary points.
- Example:

- A CEO only needs a short summary of monthly profits (concise).
- An accountant may need full detailed records of each transaction (detailed).

Presentation

- Information should be presented in a clear, neat, and easy-to-understand way.
- A good presentation helps people quickly understand and use information.
- It can be shown using tables, charts, graphs, or reports instead of just long text.
- Example: A teacher shows student attendance using a bar chart. This is easier to understand than reading a list of 500 numbers.

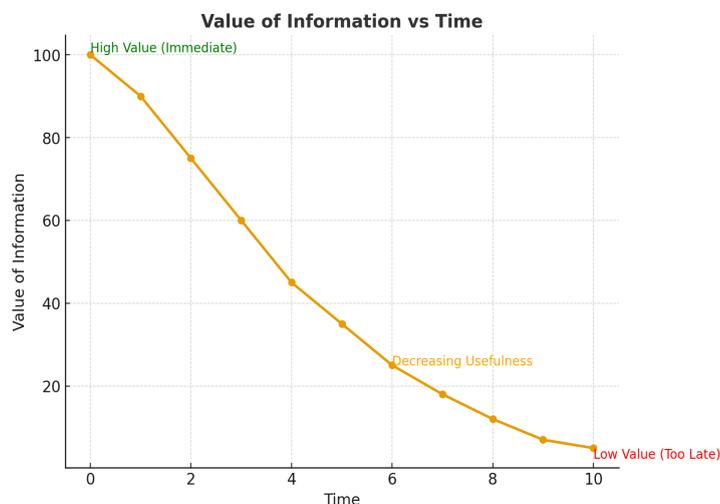
Timeliness

- Information should be available at the right time.
- If it comes too late, it may become useless.
- The value of information decreases if it is delayed.
- Example: A stock market trader must get *live* price updates. If they receive yesterday's data, it is of no use.

The Golden Rule Of Information

The **Golden Rule of Information (Value vs Time)** states that the usefulness or value of information is highest when it is received at the right time. As time passes, the value of the same information decreases because it may no longer support effective decision-making. If the information arrives too late, it can lose all of its value, even if the content is accurate and correct.

👉 **Key Idea:** “*Information has value only if it is available at the right time.*”



Explanation:

- At the beginning (**time = 0**), the value is **very high** because fresh information is most useful.

- As time increases, the curve **slopes downwards**, showing that information becomes less useful.

Example:

- If a student gets the **exam timetable one month before the exam**, it is **very valuable** (high value).
- If the timetable is given **one day before**, it is **less valuable** because there is no time to prepare.
- If the timetable is given **after the exam is finished**, the information is **worthless**.

The Need to Handle Large Volumes and other Complexities of Data

Big Data

Big Data means **extremely large sets of data** that are too big or too complex for normal computers or traditional software to handle. It includes data from many sources like social media, online shopping, sensors, mobile apps, banking systems, and more. Big Data is not just about size, but also about how fast it grows and how different the types of data are (text, images, videos, numbers, etc.).

Ex: YouTube handling millions of video uploads daily, Banks processing thousands of transactions per second, Google storing and searching through trillions of web pages.

Characteristics of Big Data - 5Vs

1. Volume

Volume means the **huge size of data** produced every day from different sources. The amount of data is so large that traditional storage systems (like normal databases) cannot handle it. Big Data technologies such as Hadoop and cloud storage are used to store this massive information.

Ex: Facebook generates terabytes of posts, likes, comments, and messages daily, which is too big for normal systems to manage.

2. Velocity

Velocity refers to the **speed at which data is generated, transferred, and processed**. Data today is created in real time or near real time, and organizations need to process it quickly to make useful decisions.

Ex: Stock market systems update share prices within milliseconds, and online payment systems process thousands of transactions per second.

3. Variety

Variety means Big Data comes in **different types and formats**, not just numbers or text. It can include structured data (like tables), semi-structured data (like XML or JSON), and unstructured data (like images, videos, and audio). This variety makes it harder to store and analyze.

Ex: WhatsApp data includes text messages, emojis, images, videos, documents, and voice notes—all different forms of data.

4. Veracity

Veracity is about the **accuracy, quality, and trustworthiness** of data. Since data can be incomplete, duplicated, or false, it is important to clean and verify it before analysis. Without veracity, decisions based on data may be wrong.

Ex: Social media may spread fake news or false information; unless it is verified, it cannot be trusted for decision-making.

5. Value

Value refers to the **usefulness of data**. Collecting large amounts of data is not enough unless it provides benefits or insights. Value is what organizations gain after analyzing Big Data to make better decisions.

Ex: Amazon analyzes customer browsing and purchase history to recommend products, which increases sales and profits.

Traditional Data

Traditional data is **structured, organized, and manageable in volume**. It's the type of data that has been used by businesses for decades, typically stored in systems designed for smaller datasets, such as relational databases and spreadsheets. Unlike modern "big data," it's not characterized by its immense volume, high velocity, or wide variety of formats.

Ex: **Sales Transactions:** Data from a point-of-sale system, detailing individual sales with information like date, time, product ID, and price

Employee Information: A human resources database containing employee names, job titles, hire dates, and salary information.



Fun Facts:

The Data Deluge: Over 90% of the world's data was created in the last two years alone. This rapid growth is a key reason we now talk about "big data."

Investigate the need of Technology to Create, Disseminate and Manage Data and Information.

Applicability of Information in Day to Day Life.

Information does an important task in the activities of daily life of the people and the organization which can be discussed under four categories.

1. Decision Making

Before a decision can be made, you need to understand the problem. Information helps define the scope, identify the root causes, and clarify the objectives. Without this, a decision might not even address the right issue.

Information offers a clear picture of the current situation and reveals potential alternatives. By analyzing data, you can see trends, identify opportunities, and understand potential risks associated with each choice.

Every decision carries risk. By using accurate and relevant information, you can reduce this risk. Information allows for a more predictable outcome by letting you analyze potential consequences and prepare for different scenarios

Ex: **Choosing a Restaurant:** You read online reviews, check the menu, and look at the star ratings. This **information** helps you decide on a restaurant that fits your preferences for food quality, price, and atmosphere.

2. Policy Making

Information helps to identify and define the problems that require a policy solution. By collecting data, organizations can measure the magnitude of an issue, identify its causes, and determine who is most affected. This ensures that the policy addresses a real and significant problem.

Information provides a basis for creating solutions. By analyzing different approaches and their potential outcomes, policymakers can select the most effective and efficient course of action. This stage often involves looking at what has worked in similar situations in the past.

Ex: Workplace Safety Policy

3. Prediction

The first step is to gather relevant historical data. This data is then cleaned to remove errors, fill in missing values, and transform it into a format that a model can understand. This "data janitorial work" is a crucial step that ensures the reliability of the prediction.

Data scientists use various algorithms to build a predictive model. The model is essentially a mathematical equation or set of rules that learns patterns and relationships from the historical data.

The model is "trained" by feeding it the historical data. During this process, the algorithm learns the patterns and relationships between the variables and the outcome it is trying to predict.

Once the model is trained and validated, it can be applied to new, unseen data to generate a prediction. For example, a trained sales prediction model can take new data (like current marketing spend and seasonality) and forecast the sales for the next quarter.

Find TRUE or False.

1. Data are raw facts and figures that have no context or meaning on their own. (True/False).
2. Information is the output of processing and is useful for decision-making. (True/False).
3. Qualitative data can be subjected to an arithmetical process like addition and subtraction. (True/False).
4. Most data processing tasks today use qualitative data. (True/False).
5. Manual Data Processing is the fastest and most efficient method for handling large volumes of data. (True/False).
6. One of the disadvantages of Manual Data Processing is its high cost. (True/False).
7. Electronic Data Processing (EDP) is a modern method that relies on computers and software. (True/False).
8. The characteristic of timeliness in information means it must be correct and free from errors. (True/False).
9. According to the Golden Rule of Information, the value of information increases over time. (True/False).
10. The "Volume" characteristic of Big Data refers to the speed at which it is generated. (True/False).

Write Short Answers only ?

1. What is the difference between data and information?
2. What are the two main types of data?

3. What are the three main methods of data processing?
4. What does the "Veracity" of Big Data mean?
5. What is the Golden Rule of Information?
6. Give an example of how information is used for policy-making.
7. What is the main characteristic that separates traditional data from big data?
8. How is information used in decision-making?
9. What is a prediction based on data?
10. Give an example of unstructured data.

Drawbacks of Manual Methods used in Manipulating Data and Information

Weaknesses of the traditional data processing method

- Consuming a longer time.
- Cost incurred is high (high labour)
- Having no value of the information as they are not timely.
- Doubt about the accuracy of the information.
- Inefficiency.

Infeasibility of applying manual methods where it can be harmful to humans

Some tasks are too **dangerous** for humans to perform manually, leading to the use of automated or robotic methods. These tasks often involve exposure to harmful environments, substances, or conditions that pose a significant risk of injury, illness, or death. Automation in these scenarios not only improves safety but also increases efficiency and precision.

Ex: Handling of Radioactive Materials, Deep-Sea Exploration

Emergence of ICT Era

Usage of IT to overcome the drawbacks of manual methods of data processing.

Using information technology (IT) to process data overcomes the significant drawbacks of manual methods by leveraging automation, speed, accuracy, and scalability. Manual data processing is slow, prone to human error, and costly, especially when dealing with large volumes of data. IT solutions like specialized software and automated systems fundamentally change how data is handled, making the process faster, more reliable, and more efficient.

The main advantages of ICT over manual methods are,

- Speed of processing
- Data storage capacity
- Accuracy
- Ability to produce various different formats
- Improved security of data

Usage of information in various Domains

Information technology (IT) is the use of computers, storage, networking, and other physical devices, infrastructure, and processes to create, process, store, secure, and exchange all forms of electronic data. The usage of IT-based information is not just about having data; it's about transforming that data into actionable insights that drive outcomes across various domains.

Here's a breakdown of how IT-based information is used in different sectors:

- Business and Commerce
- Healthcare and Medicine
- Education
- Government and Governance

Availability of Technologies Related to Information Retrieval and Sharing

The ability of inquiring information stored in a certain media is called retrieval. There are traditional and modern methods which are used to communicate information.

- Traditional methods
 - Usage of Sound of Communication.
 - Ola Leaves
 - Letters
 - Newspapers and Magazines
- Modern methods
 - Email
 - Short Message Systems. (WhatsApp)
 - Usage of websites

Traditional Methods are high cost and consuming long time periods. But when we use ICT for that it takes only very little time and a very low cost.

Development of Computer Networks, the Internet and WWW

The Internet is the best thing that has happened to the world when it comes to ICT. The fastest method of communication with the world public is the internet. We can call it an “Information Super Highway”.

The Internet is a massive, worldwide network of computers and other devices that are all connected to each other. Think of it as a huge web of interconnected networks. The main purpose of the Internet is to let people and devices share information and communicate with one another from anywhere in the world. This is what makes things like sending emails, browsing websites, watching videos, and using social media possible.

The World Wide Web, or WWW, is a system of interconnected documents and resources accessed via the Internet. Connecting all websites together. It's the main service of the Internet.

Now we can transfer information very easily through the world.

Therefore, the world has become a “**Global Village**”.

Development of mobile communication, mobile computing and cloud computing

Mobile Communication

Mobile communication is a form of wireless communication that allows the transmission of data, voice, and video between devices without the use of physical cables. It relies on a network of towers (or satellites) that transmit and receive radio waves to connect mobile devices like smartphones, tablets, and laptops. This technology enables people to communicate and access information while on the move, regardless of their location.

Ex: Making a Call, Sending a Text Message, Mobile Internet, Mobile Payments

Mobile Computing

Mobile computing is the use of portable computing devices to access and process information while on the move. It combines three key components: **mobile communication** (wireless networks like Wi-Fi or cellular), **mobile hardware** (the devices themselves), and **mobile software** (the applications and operating systems). This technology allows users to stay connected and productive without being tied to a fixed physical location.

Ex: Check bank balances online, Sending emails using mobile phones.

Cloud Computing



Cloud computing is the delivery of computing services—including servers, storage, databases, networking, and software—over the Internet. Instead of owning and maintaining your own physical hardware and data centers, you rent these resources on an as-needed basis from a cloud provider. This model allows for greater flexibility, scalability, and cost-efficiency because you only pay for what you use, and you can easily scale resources up or down to meet demand. Essentially, it allows you to access powerful computing resources from anywhere with an internet connection.

Ex: Think of it like using Google Docs. You don't need to install Microsoft Word on your computer or buy a large storage drive for your files. Instead, you access a word processing application and save all your documents on Google's servers, which is "the cloud." You can then access and edit those documents from any device, anywhere, as long as you have an internet connection.

Features of Cloud Computing

- Ability to access data and services from anywhere in the world. (Location doesn't matter)
- Cloud computing is rapidly expanding nowadays.
- Reliable service. Owners of the cloud servers are investing more money and the keenly interest to maintain services for their clients.
 - Amazon Web Services (AWS): \$75 billion.
 - Microsoft (Azure): \$80 billion in AI-enabled data centers.
 - Google Cloud Platform (GCP): \$75 billion to expand its AI and cloud capacity.
- High Security for data than that in a personal computer.

Main services provided by Cloud Computing

1. Infrastructure as a Service (IaaS)

IaaS is the virtual delivery of computing resources such as servers, storage and networking facility.

Ex: Imagine you want to start a new business website. With IaaS, you rent a **virtual server** from a provider like Amazon Web Services (AWS) or Microsoft Azure. You get the server's basic computing power and storage, but you have to install the operating system (like Windows or Linux), set up the web server software, and upload your website's files yourself.

2. Platform as a Service (PaaS)

PaaS provides a complete environment for **developing, testing, and running applications**. The cloud provider manages the underlying hardware and software, including the operating system, server software, and databases. You only need to focus on writing your code and managing your application. This is great for developers who don't want to worry about the infrastructure.

Ex: You're a developer building a mobile app. With PaaS, you use a service like Google App Engine or Heroku. The platform gives you all the tools you need—the programming languages, databases, and a place to host your app. You just upload your code, and the platform handles everything else, from managing the servers to scaling your app to handle more users.

3. Software as a Service (SaaS)

SaaS is the most common type of cloud service. It delivers **fully functional software applications** over the internet. The user doesn't need to install or manage anything. The cloud provider handles all the infrastructure, maintenance, updates, and security. You simply access the software through a web browser or a mobile app and use it.

Ex: Google docs, Gmail, Office 365

Advantages of Cloud Computing

- Ability to use the software with low costs and store data.
- Enabling users with the opportunity to work with data and information with the above mentioned facilities with rapid usage of mobile devices.
- Fewer problems in maintaining.
- The ability to use the latest software as the cloud server owners update the software frequently.
- Ability to connect and work in an environment which is technically improved.
- Unlimited storage capacities.
- Mobile devices can keep battery power by processing data outside that devices.

Disadvantages of Cloud Computing

- Need for continuous internet connectivity.
- Decrease in processing speed under low internet connections.



Formulates an Abstract Model of Information Creation and Evaluates its Compliance with ICT

Abstract Model of Information Creation

Input >> **Process** >> **Output**

This is the Abstract model of information creation.

Input means entering data and the commands / instructions on how to process data.

Preparation of data according to the commands given is called process.

Displaying processed information to the external world is called output.



Let's Revise

1. Manual data processing is inefficient and consumes a longer time compared to methods using ICT. (True/ False)
2. Handling radioactive materials is an example of a task where manual methods are infeasible due to safety risks. (True/ False)
3. The "Information Super Highway" is a term used to describe the World Wide Web. (True/ False)
4. In an Abstract Model of Information Creation, "Process" refers to displaying the processed information. (True/ False)
5. Infrastructure as a Service (IaaS) provides users with a complete environment for developing and running applications, so they only need to focus on their code. (True/ False)
6. Google Docs is an example of a Software as a Service (SaaS) application. (True/ False)
7. A key advantage of cloud computing is the reduced need for continuous internet connectivity. (True/ False)
8. One disadvantage of cloud computing is that mobile devices can run out of battery faster due to the extra processing required for cloud-based tasks. (True/ False)
9. The World Wide Web (WWW) is the physical network of computers that connects the world. (True/ False)
10. One of the main advantages of using ICT over manual methods is the improved security of data. (True/ False)

Select and Classifies the Basic Components of a Computer System

Devices and the softwares installed in it are called a computer system. These components available in a computer system can be divided into three sections.

1. Hardware
2. Software
3. Live ware

Hardware

All the devices connected into a computer which can be seen by natural eyes and things that can be touched physically (visible and tangible) are called hardware. Computer monitor,

printer, keyboard, CPU are some examples.

List of External Hardware:

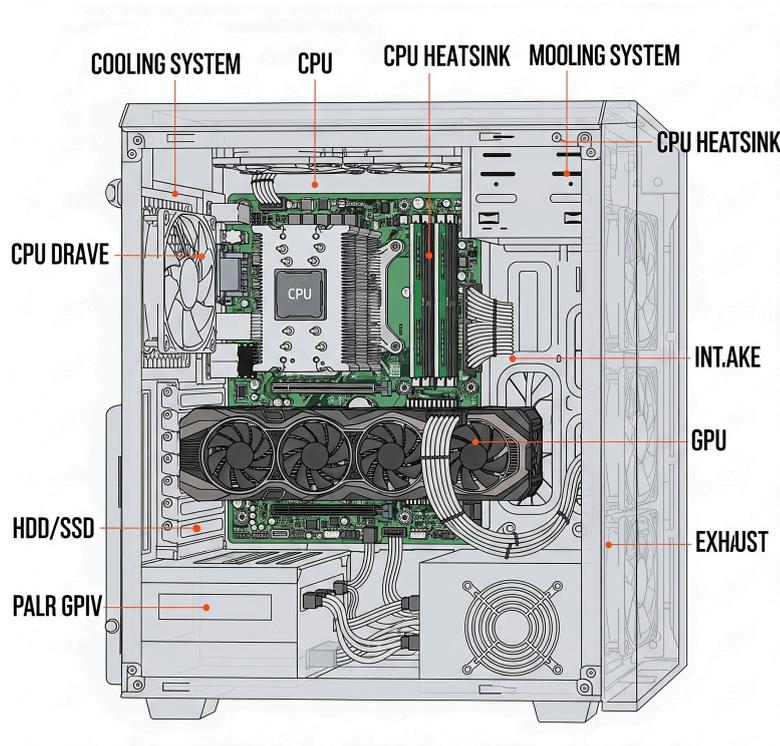
- **Monitor:** The display screen that shows visual output.
- **Keyboard:** An input device with keys for typing text and commands.
- **Mouse:** A pointing device used to navigate the graphical user interface.
- **Printer:** An output device that produces hard copies of documents or images.
- **Scanner:** An input device that converts physical documents or images



into digital files.

- **Speakers / Headphones:** Output devices that produce sound.
- **Webcam:** An input device that captures video and still images.
- **Microphone:** An input device that captures sound.
- **Router / Modem:** Networking devices used to connect to the internet.

External hardware, or peripherals, are components that connect to the computer from the outside.



List of Internal Hardware:

- **Motherboard:** The main circuit board that connects all the other components.
- **Central Processing Unit (CPU):** The "brain" of the computer that performs most of the calculations.
- **Random-Access Memory (RAM):** Temporary memory used to store data that the CPU is actively using.
- **Hard Drive / Solid-State Drive**

(HDD/SSD): Long-term storage for data and software.

- **Graphics Processing Unit (GPU):** A specialized processor that handles rendering images, videos, and animations.
- **Power Supply Unit (PSU):** Converts power from a wall outlet into the low-voltage power needed for the internal components.
- **Cooling System:** Components like fans and heatsinks that prevent the system from overheating.

Classification of Computer Hardware

1. Input Devices

Input devices are pieces of computer hardware that allow you to **enter data and instructions into a computer** for processing. They act as a bridge between the user and the computer, translating human actions and information into a format the computer can understand.

Ex:

- **Keyboard:** For typing text and commands.
- **Mouse:** For pointing, clicking, and navigating on the screen.
- **Microphone:** For recording sound and voice commands.
- **Webcam:** For capturing video and still images.
- **Scanner:** For converting physical documents or images into digital files.

- **Joystick:** For controlling movement in video games.
- **Touchscreen:** For interacting directly with the display using your finger or a stylus.
- **Digital Camera:** For taking pictures and videos.
- **Barcode Reader:** For scanning barcodes to retrieve product information.
- **Graphics Tablet:** For drawing or sketching with a stylus.

2. Output Devices

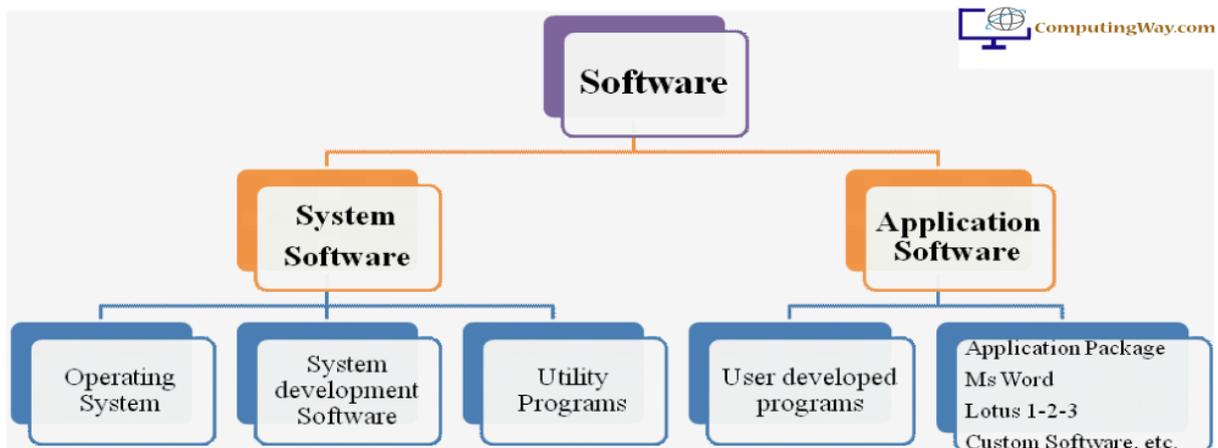
Output devices are computer hardware components that **display, print, or reproduce the results of data processing**. They translate the information processed by the computer into a human-understandable format, like visual displays, sound, or physical documents.

Ex:

- **Monitor:** A screen that displays visual information. (Soft Copy)
- **Printer:** Creates a physical copy of documents or images. (hard Copy)
- **Speaker:** Generates sound, such as music or speech.
- **Headphones:** An audio output device that is worn over or in the ears.
- **Projector:** Projects an image or video onto a large surface.
- **Plotter:** A specialized printer that creates high-quality, large-format graphics, like blueprints.
- **Braille Embosser:** A device that prints text in a format that can be read by a visually impaired person.

Software

Software is a collection of instructions, data, or programs that tell a computer what to do and how to operate. It's the intangible part of a computer, contrasting with **hardware**, which refers to the physical components like the CPU and RAM. Think of hardware as the body and software as the brain, giving the body its purpose and function.



Software is typically divided into two main categories:

1. System Software

This manages and controls the computer's hardware and provides a platform for application software to run. It's the fundamental software without which a computer can't function. This also allows users to connect with computers. This manages all functions related to the computer system.

System software has 4 sub-software.

- Operating System (OS)

This is the most crucial system software. It manages all the hardware and software resources, provides a user interface, and allows other programs to run. Examples include **Microsoft Windows, macOS, and Linux**.

- Device Drivers

These are small programs that allow the operating system to communicate with and control a specific piece of hardware, such as a printer or a graphics card.

- Utility Software

These programs help to maintain and optimize the computer's performance. Examples include **antivirus software**, disk cleanup tools, and file compression programs.

- Language Translator

A **language translator** is a special type of system software that is essential for a computer to understand and execute human-written code. Computers only understand machine language, which is made up of binary code (0s and 1s). Language translators bridge this gap by converting code written in high-level languages (like Python, Java, or C++) into machine code.

There are three language translators.

- Compiler.

A **compiler** translates the entire program's source code into a machine language file (**object code**) all at once, before the program is executed.

- Interpreter

An **interpreter** translates and executes a program's source code line by line, without creating an intermediate executable file.

- Assembler

An **assembler** is a translator specifically used to convert programs written in **assembly language** (a low-level language) into machine code.

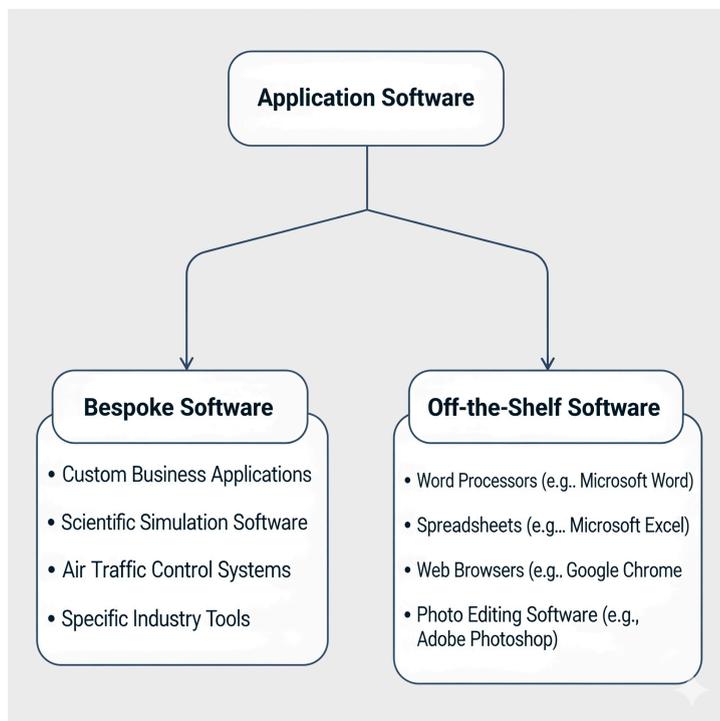
2. Application Software

This is designed to perform specific tasks for the user. These are the programs we use every day to be productive or for entertainment. Examples as below,

- Productivity Software (Ms Office Package)
- Multimedia Software (Adobe Photoshop and VLC Media Player)
- Web Browsers (Google Chrome, Mozilla Firefox, and Microsoft Edge)

There are two main types of Application Software.

1. Bespoke Software
2. Off-the Shelf Software



Bespoke Software:

Bespoke software, also known as **custom software**, is a type of application software that is developed and tailored specifically for a particular organization or user to meet their unique needs. It is built from scratch to fit a specific purpose and is not available for purchase by the general public.

Advantages:

- Perfect Fit
- Scalability
- Competitive Advantage
- No Unnecessary Features

Disadvantages:

- High Cost
- Long Development Time
- Maintenance
- Risk

Off-the-Shelf Software:

Off-the-shelf software, also known as **packaged** or **commercial software**, is a ready-made product designed for a wide range of users and businesses. It is mass-produced and sold to the general public, and can be purchased and used immediately.

Advantages:

- Low Cost
- Immediate Availability
- Widespread Support
- Regular Updates
- Tested and Reliable

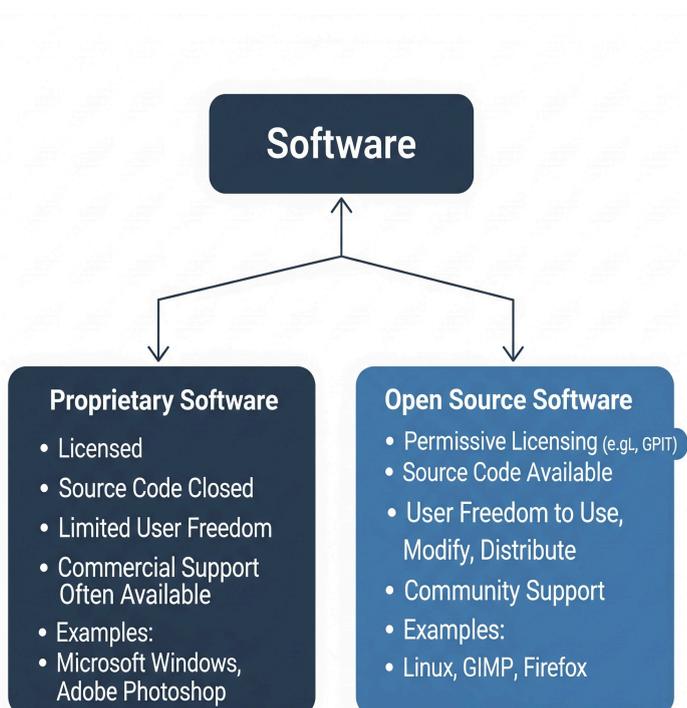
Disadvantages:

- Limited Customization
- May Not Meet All Needs
- Unnecessary Features
- Lack of Control

Firmware

Firmware is a type of software that provides **low-level control** for a device's hardware. It acts as a bridge between the physical components (hardware) and the user-facing software, such as the operating system. Unlike typical application software, firmware is permanently embedded into a device's non-volatile memory, like a **Read-Only Memory (ROM)** chip or flash memory. This means it doesn't get erased when the device is powered off. A computer's **BIOS (Basic Input/Output System)** or **UEFI** are some examples.

Classification of Software according to the Legal Condition



1. Proprietary Software

(Licensed Software)

Proprietary software is also known as **closed-source software**.

It is software that is owned by an individual or a company, and its source code is kept private and confidential. To use this software, you must purchase a license or subscription, and this license comes with strict terms about how you can use the software.

Companies have intellectual property rights about those software.

Key Characteristics:

- Source Code is Hidden
- Requires a License
- No Modification Allowed

Examples: Microsoft Windows, Microsoft Office Suite, Adobe Photoshop, Apple macOS.

Advantages:

- **Dedicated Support:** You can usually get professional, reliable technical support directly from the company.
- **User-Friendly:** These products are often highly polished, well-documented, and easy for the average user to learn.
- **Reliability:** The company is fully responsible for fixing bugs and providing regular updates, which can make the software more stable.

Disadvantages

- **High Cost:** The upfront or recurring costs can be very high.
- **Limited Customization:** You cannot change the software to fit your specific needs; you have to use it as it is.
- **Lack of Transparency:** You cannot audit the code for security vulnerabilities, so you have to trust the vendor.

2. Open Source Software

Open Source Software (OSS) is software where the source code is made publicly available for anyone to view, use, modify, and distribute. It is developed and maintained by a collaborative community of developers, and its licensing grants users certain freedoms.

Key Characteristics:

- Source Code is Public
- Free or Low Cost
- Modification Allowed
- Community-Driven

Examples: Linux Operating System, Mozilla Firefox, LibreOffice, GIMP (GNU Image Manipulation Program).

Advantages:

- **No Cost:** You do not have to pay for a license to use the software.

- **Flexibility and Customization:** You can modify the source code to add features or change functionality, giving you complete control.
- **Enhanced Security:** The open nature allows a large community of developers to inspect the code, which means bugs and security flaws are often found and fixed more quickly.

Disadvantages:

- **Limited Official Support:** While community support is available, there may not be a dedicated help desk for troubleshooting.
- **Complexity:** Some open-source projects can be complex to install, configure, and manage, often requiring a higher level of technical expertise.
- **Uncertainty of Quality:** The quality of documentation and support can vary widely between different projects.



Share Ware

Shareware is a type of proprietary software that is distributed for free on a "try before you buy" basis. It is a marketing strategy used by software developers to give potential customers a chance to test out a program before they purchase the full version.

LiveWare

Liveware is a term used to describe the **human element** of a computer system. It refers to the people who interact with, operate, and manage the hardware and software. It is a concept used to emphasize that a computer system is not just a collection of machines and programs, but also relies on human intervention to function.



A complete computer system is made up of three interdependent components:

hardware, software, and liveware.

Analysis of the Activities of Data Processing

Steps of Data Processing

Life Cycle of data can be discussed under five categories as follows.

1. Data Gathering

Collecting necessary data and entering into the computer is related to this step.

2. Data Validation

The methods and techniques used to enter data accurately into the computer is considered as validation of data.

3. Data processing

Conversion of the entered data into information according to the requirement is called data processing.

4. Output

The process is related to obtaining the output after converting the data into information.

5. Storage

Storing data as well as information for future use is related to this.

Data Gathering Methods

Data can't be found in a single place. It's scattered and we have to collect data and gather them to make information. There are two types of data gathering methods.

1. Manual data gathering method.
2. Semi-automated and automated methods.

Manual data gathering method.

Manual data gathering is the process of collecting and recording data without the use of automated systems. It relies entirely on human effort, where individuals collect information directly from a source and then manually enter it into a computer system or a physical record.

Methods of Manual Data Gathering:

1. **Questionnaires and Forms:** This involves providing a set of questions or fields for people to fill out. The data is then manually entered into a computer or a physical record.
2. **Interviews:** This method involves a direct, one-on-one conversation between an interviewer and a respondent to collect information.
3. **Observation:** This method involves a person watching and recording events or behaviours in a particular setting. This is useful for gathering qualitative data where non-verbal cues and context are important.

For example, a marketing researcher might observe how customers interact with a product in a store.

4. **Documents and Records:** Data can be manually extracted by a human from existing paper documents, records, or files, such as a patient's medical history or a company's financial records.

Semi-automated and automated methods

In a hybrid system, the automated component handles the bulk of the data gathering, such as using sensors to continuously collect temperature readings from a factory floor. However, when the automated system encounters an anomaly or an event it cannot interpret (e.g., a sudden spike in temperature), it flags the data for a human to review. The semi-automated part of the system then requires a human to investigate the specific event and input the necessary contextual information.

There are some characteristics listed below,

- Higher Accuracy
- Increased Efficiency
- Improved Context
- Cost-Effectiveness
- Better Problem Solving

Automated data gathering tools.

1. Magnetic Ink Character Recognition (MICR)
2. Optical Mark Reader (OMR)
3. Optical Character Recognition (OCR)
4. Card Readers
5. Bar Code Readers
6. Sensors
7. Loggers

Data Validation

Data validation is the process of ensuring that data is **correct, clean, and useful** before it is stored or processed by a computer system. It is a proactive step that checks for the accuracy and integrity of data at the point of entry. The main purpose of data validation is to prevent errors and ensure that the data being used is reliable.

By applying a set of rules, data validation ensures that the input is in a valid format, type, and range, which helps to maintain the overall quality of data in a system.

There are different types of data validation methods.

1. **Data Type Check:** Ensures that the data entered is of the correct type. For example, a field for "Age" should only accept numbers, not letters or symbols.
2. **Presence Check:** Ensures that a required field is not left blank. For example, a form might require a user to enter their name before it can be submitted.
3. **Range Check:** Checks that a numeric value falls within a specified minimum and maximum range. For example, a grade might be required to be between 0 and 100.
4. **Format Check:** Ensures that the data follows a specific format or pattern. For example, an email address must contain an "@" symbol and a dot, or a phone number must have a specific number of digits.
5. **Length Check:** Ensures that the data is a certain length. For example, a password might be required to be at least 8 characters long.
6. **Look-up Check (or List Check):** Validates that the data entered is a value from a predefined list. For example, a "Country" field might only accept values from a drop-down list of valid countries.

Data Verification

Data verification is the process of checking that data has been entered **accurately** by comparing it with the original source document. Its primary goal is to ensure that the data captured is a true and correct copy of the original information, preventing human transcription errors.

Unlike **data validation** which checks if data is sensible and fits a set of rules (e.g., age must be a number), verification checks if the data entered is an exact match of the source data (e.g., did the user type "15" instead of "51").

There are few verification methods mentioned below.

1. Allowing to enter same data twice

This method is known as **double-entry verification**. The same data is entered into the system twice, either by the same person or by two different people. The computer system then automatically compares the two entries. If the two entries do not match, the system will flag the discrepancy, prompting a human to review and correct the error. This is a highly effective way to catch typing and transcription errors.

Ex: **Password Creation:** When you create a new password or email address on a website, the system often asks you to "**re-enter password**" or "**confirm email address**". The system

then compares the two entries. If they don't match, it displays an error message, preventing you from saving a mistyped password.

2. Checking the entered data through the screen before sorting

This is a form of **visual verification** performed on a digital screen. After the data has been entered, the person who entered it (or another person) visually checks the on-screen data against the original source document. This manual process is done before the data is processed, sorted, or saved to prevent immediate errors from entering the system.

Ex: **Filling an Online Form:** When you fill out an online registration form, you typically review all the information you've entered—such as your name, address, and phone number—on a "review" or "summary" screen before clicking the final "**Submit**" button.

3. Printing and checking the entered data

This is another form of **visual verification**, but it involves reviewing a physical hard copy of the entered data. The data is first printed out, and then a person manually proofreads the printed report against the original source documents. This method can be useful for checking large volumes of data where errors might be more difficult to spot on a screen.

Ex: **Sales Report:** After a data entry clerk enters a month's worth of sales figures into a spreadsheet, they may print the entire report. A manager or another clerk then takes this printed report and compares it against the original, handwritten sales slips to ensure every number has been correctly transcribed, thereby catching any mistakes before the report is finalized.



Let's Revise!

1. A computer mouse is an example of a core internal hardware component. (True/False).
2. An interpreter translates an entire program into machine code at once before execution. (True/False).
3. The "try before you buy" model for software is known as freeware. (True/False).
4. Liveware refers to the physical devices and components of a computer system. (True/False).
5. Data validation checks if the entered data is an exact copy of the source data. (True/False).
6. Open Source Software generally has its source code available for public viewing and modification. (True/False).
7. A printer is an example of an input device. (True/False).
8. The "double entry" verification method helps prevent transcription errors. (True/False).
9. Off-the-shelf software is typically developed for the unique needs of a single organization. (True/False).
10. A router is considered an example of external hardware. (True/False).

Modes Of Data Input

There are several types of methods to enter data into the computer system.

1. Direct Data Input Method

Direct data input is a method where data is entered into a computer system directly from a source document or device without the need for manual transcription. This process minimizes human involvement, which speeds up data entry and reduces the chances of errors. It is often used in situations where large volumes of data need to be captured quickly and accurately.

Ex: Barcode Readers, Magnetic Ink Character Recognition (MICR), Optical Mark Recognition (OMR), RFID (Radio-Frequency Identification)

Advantages:

- Fast data entry method
- Error free when compared with the keyboard

2. Remote Data Input

Remote data input is the process of entering data into a computer system from a location that is geographically distant from the main processing unit. The data is captured at the source and then transmitted over a network (like the internet) to a central computer for processing. This method is crucial for businesses with multiple branches or a distributed workforce.

Ex: ATM (Automated Teller Machine)

3. Online Data Entry

Online data entry is a method where data is entered into a system while being **directly connected** to the central computer or network. This means the system can validate the data and provide real-time feedback immediately.

Ex: Online Registration Forms, Booking a Flight

4. Offline Data Entry

Offline data entry is a method where data is entered into a system without a continuous connection to the main computer or network. The data is collected and stored locally on a device (like a laptop or a flash drive) and then transmitted to the central system at a later time, usually in batches.

Ex: Field Surveys, Warehouse Inventory

Data Processing Methods

Methods of processing data can mainly be divided into two sections as follows.

1. Batch Processing

Batch processing is a method where a large volume of data is collected over a period of time and then processed all at once in a single group or "batch." There is a significant time delay between the data being entered and the results being produced. This method is highly efficient for tasks that don't require immediate results.

Ex:

- **Payroll System:** A company collects all employee hours over a two-week period. At the end of that period, the entire batch of data is processed to calculate salaries and generate paychecks.
- **Utility Billing:** Utility companies collect electricity or water usage data from all customers throughout the month and process the entire batch to generate bills on a specific date.

Advantages:

- **Efficiency:** It's highly efficient for processing large volumes of data with minimal human supervision.
- **Cost-Effective:** It is generally less expensive than real-time processing because it doesn't require constant network connections or immediate processing power.
- **Resource Management:** It can be scheduled to run during off-peak hours (e.g., at night) when the computer system has more available resources, which reduces the load on the system during the day.

Disadvantages:

- **Time Delay:** The main drawback is the significant delay between data entry and output, which makes it unsuitable for tasks that require immediate results.
- **Outdated Information:** The processed information is not up-to-the-minute, which can be an issue for decision-making that requires real-time data.

2. Real Time Data Processing

Real-time data processing is a method where data is processed as soon as it is received, with minimal to no delay. The system provides an immediate response or output, which is essential for tasks that require instant feedback.

Ex: ATM Transactions, Online Gaming, Airline Ticket Booking

Advantages:

- **Instant Feedback:** It provides immediate results, which is critical for time-sensitive applications and services.
- **Up-to-Date Information:** The data is always current, which is vital for making quick and informed decisions.
- **Enhanced User Experience:** It offers a more interactive and responsive experience for users.

Disadvantages:

- **Higher Cost:** It requires powerful hardware and a constant network connection, making it more expensive to set up and maintain.
- **Complexity:** The systems are more complex to design and implement, and any failures can have an immediate and significant impact.
- **Resource Intensive:** It requires a high amount of computing resources to be available at all times, not just during specific batch windows.

Data Storage Methods

After processing data we can store it inside the computer system for later use. Following are the Devices used to store the data and information.

Local Storage - Devices connected directly to the computer to store data are called local storage devices.

Ex: Hard disk, Compact Disk (CD), Magnetic tapes

Remote Storage - If the data is storage in a remote place on the concept of cloud storage using the internet, it is called Remote storage.

Investigates The Application Of ICT In Different Domains.

Applications Of ICT In Different Domains

1. Education Field

ICT, or Information and Communication Technology, has become a vital tool in the education field, transforming traditional teaching and learning methods. It helps to enhance the learning

experience, improve access to information, and develop new skills for both students and teachers.

Several methods of using ICT in the educational field are mentioned below.

- To gain knowledge inside the class room.

Ex: Preparation of video clips, sceneries, magazines, letters, notes using the computer.

Playing educational computer Games.

- Obtain education.

Unlike the traditional methods in which the teacher has always to be nearby, this can be done from anywhere. There are a number of educational websites at present.

- Information and communication technology can be used as an aid in explaining lessons with video clips, diagrams, pictures and animations etc.
- Ability to have higher studies through ICT. Students can join higher study centers and engage in remote studies to become degree or diploma holders.

2. Health Field

ICT plays a crucial role in the health field by modernizing healthcare delivery, improving patient care, and increasing the efficiency of medical services. It enables better data management, communication, and accessibility, transforming how doctors, hospitals, and patients interact.

How ICT is Used in Healthcare:

- Electronic Health Records (EHR)
- **Telemedicine:** This involves using ICT to provide remote healthcare services. Doctors can consult with patients via video calls, diagnose conditions, and even monitor vital signs from a distance. This is particularly beneficial for patients in rural areas or those with limited mobility.
- **Medical Imaging:** ICT enables the digital capture, storage, and transmission of medical images like **X-rays**, **CT scans**, and **MRIs**. This allows specialists to view and analyze high-quality images from anywhere in the world, leading to faster and more accurate diagnoses.
- **Patient Monitoring Systems:** Devices such as wearable trackers and remote sensors can automatically collect and transmit real-time data on a patient's health (e.g., heart rate, blood glucose levels). This allows doctors to continuously monitor patients and detect potential issues early.
- Hospital Management Systems.

There are some equipment which are built using ICT and help for the health field.

- **Computed Tomography (CT) Scan Machine:** A machine that uses X-rays to create detailed cross-sectional images of the body.
- **Magnetic Resonance Imaging (MRI) Machine:** A device that uses a powerful magnetic field and radio waves to produce detailed pictures of organs and tissues.
- **Electroencephalography (EEG) Machine:** This equipment records the electrical activity of the brain to detect abnormalities.
- **Blood Sugar (Glucose) Testing Machine:** A small, portable device used to measure the amount of glucose in a person's blood.
- **Electrocardiogram (ECG/EKG) Machine:** A device that records the electrical signals from the heart to detect heart problems and monitor heart health. This is often used for cardiac screening.
- **Ultrasound Machine:** This machine uses high-frequency sound waves to create images of structures inside the body.
- **Endoscopy Machine:** A device with a camera on a flexible tube used to view internal organs and body cavities.

3. Agriculture

ICT is transforming the agriculture field by shifting it from traditional farming to **smart farming** or **precision agriculture**. By using technology, farmers can make more informed decisions, increase efficiency, and maximize yields while using fewer resources.

- **Precision Farming:** This method uses technology to manage crops with high accuracy. It's about ensuring crops get exactly what they need, when they need it, in the right place.
- **Farm Management Software:** These software systems help farmers manage all aspects of their operations.
- **Supply Chain Management:** ICT helps track products from the farm to the consumer's plate.
- **Market Information Systems:** These systems provide farmers with access to real-time market data.
- **Mobile Technology:** The widespread use of smartphones has made many of these ICT applications accessible to even small-scale farmers.

4. Business and Finance

In today's global economy, ICT is the backbone of all modern business and financial operations. It has revolutionized the way companies operate by automating processes, improving communication, and enabling the creation of new business models. At its core, ICT provides the tools to collect, process, and transmit vast amounts of data, which is essential for making informed decisions. Businesses use productivity software to streamline daily tasks, and rely on systems like **Enterprise Resource Planning (ERP)** to integrate all departments, from finance and human resources to sales and supply chain management. This integration provides a unified view of the company, increasing efficiency and coordination.

In the finance sector, ICT has enabled the shift to a digital-first approach. Online banking and mobile payment apps allow for secure and convenient financial transactions 24/7. Complex financial management software helps in bookkeeping, budgeting, and risk analysis. In global markets, ICT has made **high-frequency trading** and real-time market analysis possible, allowing for instant financial transactions and quicker responses to market changes. Ultimately, ICT provides the infrastructure for business to operate on a global scale, enhance customer experience, and maintain a competitive edge through improved efficiency and data security.

5. Engineering

ICT is used vastly in this field to produce various kinds of machinery, to prepare designs and planing.

6. Trade

Online markets are the best way to describe this. People can buy whatever they want from online and it saves time and money for travelling.

Ex: You can buy homes on amazon and they can deliver those homes to any location in the world.

7. Security

ICT has also revolutionized physical security by integrating various devices into a unified, intelligent system.

- CCTV and Video Surveillance
- Access Control Systems (finger prints, access cards)
- Alarm Systems
- Military

8. Entertainment

ICT has completely revolutionized the entertainment field, transforming how content is created, distributed, and consumed. It has shifted the industry from physical formats and passive consumption to digital, on-demand, and interactive experiences.

- Film and Animation
- Music Production
- Streaming Services
- Online Platforms (Social Media)
- Gaming
- Augmented Reality (AR) and Virtual Reality (VR)
- E-sports

Evaluates the impact of ICT in the Society

Benefits Caused by ICT

ICT provides numerous benefits across various sectors by enhancing efficiency, convenience, and reach. The use of ATM machines in banking is a prime example of this, as they showcase ICT's ability to provide 24/7 financial services to customers without the need for a physical bank branch or a human teller. This automation not only improves customer access to cash and banking services but also directly contributes to the capability to reduce the cost for the bank. By handling routine transactions, ATMs reduce the bank's operational expenses, such as staff salaries, rent for large branches, and the cost of processing paper transactions, thereby leading to significant long-term savings. This demonstrates how ICT leverages automation and accessibility to deliver a dual benefit: improved service for the customer and reduced costs for the business.

Issues Caused by ICT

1. Environmental Problems
 - a. E-Waste

This is arguably the most visible and toxic environmental problem caused by ICT. E-waste refers to discarded electronic devices like computers, phones, and TVs. These items contain hazardous substances, including **lead**, **mercury**, and **cadmium**, which can seep into the soil and groundwater if not disposed of properly.

b. Energy Consumption

Data Centers: These facilities, which house servers and other networking equipment, are a major source of energy consumption. They operate 24/7 and require vast amounts of electricity not only to run the servers but also to power the cooling systems needed to prevent overheating. Globally, data centers account for a significant portion of the world's electricity consumption.

2. Ethical Problems

Using ICT to do anti-social activities has begun. Producing videos, destroying photographs and publishing to gain abnormal mental happiness affects badly for forming an ethical society.

3. Legal Issues

Using personal data improperly is a damage caused to the individuality which is almost caused due to ICT. Stealing personal data and publishing them after distorting. Copying without permissions, selling others creations illegally, altering and hacking attacks can be mentioned as that has come to the effects of the ICT.

4. Adverse Effects towards the society

Human Jobs are going to be replaced by machines and computers. AI has a big impact on the job market. So lots of people are going to be replaced in the future with AI.

Confidentiality

Confidentiality issues in ICT occur when sensitive information is accessed or disclosed without authorization. These issues can arise from deliberate actions, such as hacking, where cybercriminals use malware or exploit vulnerabilities to steal data like passwords, financial records, or personal information. Another major threat is **data interception** during transmission, where unencrypted data is captured as it travels across a network. Furthermore, a significant number of confidentiality breaches are caused by human error, such as an employee accidentally sending an email with confidential information to the wrong person or leaving a device with sensitive data unsecured. Lastly, the physical theft or loss of a device like a laptop or a hard drive can lead to a major breach, as the data on it can be easily accessed if it is not properly encrypted.

Phishing

Phishing is a type of online fraud where attackers pretend to be a trustworthy person or organization to trick people into giving up sensitive information. Attackers typically use fake emails, text messages, or websites that look legitimate, such as those from a bank, a social media company, or a government agency. The message usually creates a sense of urgency or fear, like a warning that your account will be suspended if you don't act immediately. When a person clicks the link in the message, they are taken to a fake website designed to steal their personal data, such as login credentials, credit card numbers, or other private information.

Piracy

Piracy in ICT refers to the illegal copying, sharing, and use of copyrighted digital content without permission from the creator or owner. In simple terms, it's like stealing a product, but the product is a digital file, such as software, a movie, music, or an e-book. Instead of paying for a license or purchasing the content, people illegally download it from unauthorized websites, share it on peer-to-peer networks, or use "cracked" versions of software. This act violates copyright laws and causes significant financial losses for the creators and companies that invest time and resources into producing the content.

Ex: - Downloading a copyright song from the internet.

- Recording the movie from the theatre
- Distribute license software to others (crack copies)
- Selling them.
- Duplicating them.

Licensed and Unlicensed Software

Licensed Software

Licensed software is any software that you have the legal right to use. When you purchase or download a program, you aren't buying the software itself; you're buying a **license** that grants you permission to use it under specific conditions. These conditions are detailed in a **licensing agreement** or **End-User License Agreement (EULA)** that you must agree to before using the software.

There are some limitations related license software:

- Cannot be duplicated
- The original source code is not available
- Cannot see the actual code

Licensed software can be divided further as follows.

- Single user - the software is licensed for a single computer.
- Multiuser - this license allows you to install a program onto multiple computers used by multiple users.
- Site license - this license allows a program to be installed on an unlimited number of computers to be used by unlimited number of users.

Unlicensed Software

Free and open-source software (FOSS) is software that can be downloaded and used at no cost. However, it is not unlicensed. Instead, it is distributed under a specific **open-source license** (like the GPL or MIT license) that grants users a set of defined rights. These rights typically include the freedom to run, study, modify, and distribute the software's source code. You are following the rules of this license, which makes your use legal and legitimate.

Short Answer Questions (Part - 1)

1. What are the three stages of the data lifecycle as outlined in the document?
2. How does an organization perform 'Data Entry' to create data?
3. What is the primary difference between 'Data' and 'Information'?
4. According to the document, what are the two main types of data?
5. What is the main advantage of 'Manual Data Processing'?
6. What is the key difference between 'Mechanical Data Processing' and 'Electronic Data Processing'?
7. Give one example of how a lack of 'Timeliness' can make information worthless.
8. According to the 'Golden Rule of Information,' what happens to the value of information over time?
9. List the '5Vs' that characterize Big Data.
10. What is 'Unstructured Data'?
11. How is information used in 'Prediction'?
12. What are the two main drawbacks of traditional (manual) data processing methods?
13. Name two of the 'Modern methods' of information retrieval and sharing.
14. How does the Internet enable the world to become a "Global Village"?
15. What are the three key components that make up 'Mobile Computing'?

16. Explain the concept of 'Cloud Computing' using the analogy of renting resources.
17. What is the primary difference between 'IaaS' and 'SaaS' in cloud computing?
18. What is the main disadvantage of cloud computing related to connectivity?
19. What are the three steps in the 'Abstract Model of Information Creation'?
20. In the abstract model, what happens during the 'Process' step?

Short Answer Questions (Part - 2)

1. What is a key weakness of traditional data processing methods?
2. Why is automation a necessity for tasks involving dangerous environments?
3. Name two advantages of using ICT over manual methods.
4. How do modern methods of communication, such as email, compare to traditional methods like letters?
5. What is the main purpose of the Internet?
6. Explain the concept of the "Global Village."
7. What is the primary function of the World Wide Web (WWW)?
8. What is the key difference between 'Mobile Communication' and 'Mobile Computing'?
9. Name a specific example of 'Mobile Computing' from the document.
10. What is the main benefit of using cloud computing instead of owning and maintaining your own physical hardware?
11. Name two of the main services provided by cloud computing.
12. Explain the 'Software as a Service (SaaS)' model using an example from the document.
13. How does 'Platform as a Service (PaaS)' help a developer?
14. What is one of the main advantages of cloud computing related to software updates?
15. What is one disadvantage of cloud computing that is related to internet connectivity?
16. In the Abstract Model of Information Creation, what is 'Input'?
17. What does the 'Output' stage of the Abstract Model do?
18. According to the document, what is the 'Ability of inquiring information stored in a certain media' called?
19. What is one way ICT is used in the 'Government and Governance' domain?
20. In what way does cloud computing help mobile devices save battery power?

Short Answer Questions (Part - 3)

1. What is the main characteristic of a Direct Data Input method?
2. Give two examples of Direct Data Input devices mentioned in the document.
3. Explain the key difference between Online Data Entry and Offline Data Entry.

4. What is the main advantage of Batch Processing?
5. What is the primary disadvantage of Real-Time Data Processing?
6. How does an ATM demonstrate both the benefits for a customer and reduced costs for a bank?
7. Define 'Local Storage' and provide an example.
8. How does ICT transform the agriculture field, according to the document?
9. Give one example of how ICT is used to aid in education, according to the provided text.
10. Name two ICT-based medical machines used in the health field.
11. What is the role of ICT in the engineering field?
12. What is E-waste, and why is it considered an environmental problem caused by ICT?
13. Describe one ethical problem caused by the use of ICT mentioned in the document.
14. How can human error lead to a confidentiality breach in ICT?
15. What is 'Piracy' in the context of ICT?
16. Name the three types of licensed software discussed in the document.
17. What is the key right granted to users of 'Free and Open-Source Software (FOSS)'?
18. According to the document, what is the primary role of ICT in business and finance?
19. Explain what 'Telemedicine' is.
20. What is a key function of 'Farm Management Software' in agriculture?

Short Answer Questions (Part - 4)

1. What is the main advantage of a Direct Data Input method over manual transcription?
2. What is a key difference in data transmission between Offline Data Entry and Remote Data Input?
3. Explain the primary benefit of Real-Time Data Processing over Batch Processing in a system like airline ticket booking.
4. How does ICT assist in 'Obtaining education,' as opposed to 'Gaining knowledge inside the classroom'?
5. What is the function of an 'EEG Machine' in the health field?
6. According to the document, what is the significance of Enterprise Resource Planning (ERP) systems in business?
7. Name two ways ICT is used in the 'Entertainment' field, as described in the document.
8. How does ICT contribute to the 'Trade' domain?
9. Explain how a Phishing attack typically works to steal a victim's personal data.
10. What is a key legal issue that arises from improper use of personal data, as mentioned in the document?
11. What is the primary function of a 'Blood Sugar Testing Machine,' and which field does it belong to?

12. What is the main principle behind 'Precision Farming' in agriculture?
13. Describe the distinction between 'Licensed Software' and 'Unlicensed Software' as explained in the document.
14. How does the 'Multiuser' license differ from a 'Single-user' license?
15. What are the two major environmental problems caused by ICT according to the document?
16. What is the main purpose of an 'Access Control System' in the context of security?
17. How has ICT revolutionized music production?
18. What is the adverse effect of ICT on society related to the job market?
19. Name two types of medical equipment that use ICT to create images of a patient's body.
20. In what way does ICT help with Supply Chain Management in agriculture?

True or False Questions

1. Data is the primary raw material used to create information. **(True/False)**
2. Obsolete data should be kept in a secure database for a long period of time to ensure it can be retrieved later. **(True/False)**
3. 'Qualitative data' can be used in mathematical analysis and be subjected to arithmetic processes. **(True/False)**
4. 'Electronic Data Processing' is the most widely used data processing method today. **(True/False)**
5. One of the main disadvantages of manual data processing is its high cost due to a large labor requirement. **(True/False)**
6. The "Velocity" of Big Data refers to the speed at which it is generated and processed. **(True/False)**
7. A lack of 'Completeness' in information can lead to wrong or unfair decisions. **(True/False)**
8. The "Global Village" concept is a drawback of the internet. **(True/False)**
9. The main disadvantage of cloud computing is its limited storage capacity. **(True/False)**
10. The 'Output' stage of the Abstract Model of Information Creation is where data is entered. **(True/False)**