The background of the image shows a dense array of fiber optic cables, with their ends glowing and creating a blue, ethereal light effect. A large black rectangular box is overlaid on the left and center of the image, containing the title text in yellow.

# **Information Technology For Managers**

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# UNIT 1 INFORMATION TECHNOLOGY: AN OVERVIEW

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## Structure

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Definitions of IT
- 1.4 Types of IT Systems
- 1.5 Business Perspective of IT
- 1.6 Internet and its Business Applications
- 1.7 Computer Aided Decision Making
- 1.8 Summary
- 1.9 Unit End Exercises
- 1.10 References and Suggested Further Readings

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## 1.1 INTRODUCTION

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Information Technology (IT) has become a strategic necessity. Unless we believe in IT and act on it, there is every chance of becoming a footnote in the annals of History. IT has become a vital component of successful businesses and organizations. Managers are expected to identify opportunities to implement information systems to improve the business processes. Managers are also required to lead IS projects in IT.

Information Technology has become a major facilitator of business activities. It is also a catalyst of fundamental changes in the structure, operations and management of organizations. IT can be used to:

1. Perform high-speed, high-volume, numeric computations.
2. Provide fast, accurate and inexpensive communication within and between organizations.
3. Store huge amounts of data in an easy-to-access yet small space and allow quick and easy access.
4. Automate semiautomatic business processes and manually done tasks.

IT has been used for improving productivity, reducing cost, enhancing decision making process, enhancing customer relationships, and developing new strategic applications. The business paradigm has completely shifted from being sellers market to buyers market. Customers have become the focal point of any business. The business environment is no more as stable as it used to be and has become much more competitive. It became mandatory on the part of the organizations to make full use of IT to survive. IT has become one of the standard components of an organization.

The individuals are supported by IT to fulfill their roles. The management and the business processes have become IT oriented. Organization structure and strategy are also supported by IT. Whenever an external or internal pressure is felt by an organization, IT helps the organization to plan critical response activities. The changed government policy may create a pressure on an organization. But such a pressure is distributed over a long period as government gives enough time to organizations to respond to changed policies. But if there is a change in the behavior of consumers, the organization should be able to identify the change. Moreover, they

should be able to come up with a solution fast. IT helps an organization to anticipate and stay ahead of problems. The organization can take proactive measures rather than firefighting measures.

An organization can use an IT supported strategic system to increase their market share. IT can help an organization negotiate better with their suppliers. Maintaining and improving quality of products and processes in an organization needs regular support, vigilance, and innovation. IT has been used extensively for productivity improvement, reducing inventory and maintaining quality. Management Information System (MIS) and decision support system (DSS) have been used to help management in decision-making process.

Business process reengineering (BPR) has become the need to the day for every business; BPR involves changing business processes in an innovative way. IT plays a major role in BPR. Internet and Intranet help an organization in changing its business processes to reduce cycle time and time to market a product. IT makes information available to employees with different level of access. As a result, employees can be given more independence to make decisions. The ERP, a strategic tool, heavily uses IT to integrate business processes of an organization.

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## **1.2 OBJECTIVES**

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After reading this unit, you should be able to:

- Define information technology and state the advancement of IT;
- Identify the different types of Information systems;
- Contextualize a business perspective of IT;
- Describe the significance of Internet and its business applications; and
- Explain the role of Computer Aided Decision System in business environment.

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## **1.3 DEFINITIONS OF IT**

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Let us understand what information is. *Information is the finished product for which data is the raw material.* The dictionary defines information as *processed data, which is used to trigger certain actions or gain understanding of what the data implies.*

Information has also been defined as *data that have been put into a meaningful and useful context and communicated to a recipient who uses it to make decisions. Information involves the communication and reception of intelligence or knowledge. It apprises and notifies; surprises and stimulates, reduces uncertainty, reveals additional alternatives or helps eliminate irrelevant or poor ones, and influences individuals and stimulates them to action.* The information must be received by the recipient within the required time frame and the information must be free from errors.

The technology plays an important role in delivering timely and error free information to its recipients. Technology includes hardware, software, databases, and communication system. Hardware is a set of devices such as processor, monitors, keyboard, and printer that accept data, process them, and display them. Software is a set of programs that enable the hardware to process data. Database is also an integral part of IT system, which is a collection of related files, tables, relation etc. that stores data and the association among them. Network connects computing resources of an organization and facilitates sharing of hardware and software. The organization processes and people are integral part of an IT System.

Now we know what information is and what technology is. Now are ready for a definition of IT.

*Information Technology means the collection, storage, processing, dissemination, and use of Information. It is not confined to hardware and software but acknowledges the importance of man and the goals he sets for his technology, the values employed in making these choices, the assessment criteria used to decide whether he is controlling the technology and is being enriched by it.*

Information Technology Serving Society, USA in 1979, has given the above definition.

The above definition clearly states that IT is an important tool, which must be used properly. At one time, 60% people used to work in agriculture. Nowadays, in a developed country, about 10% people work in agriculture and 40% people work in information related fields. In a developed country such as US, 50% households have computers and Internet connection. In India, only about 8 people out of every 1000 have access to computers. However, India is making steady progress.

As far as history of computing is concerned, people tried to invent a computing machine as early as 800 BC. Abacus is one of the oldest computing devices that are still in use. Every child in China learns to use abacus in school. Our ancestors had built various other mechanical machines using gears. All these efforts laid foundation for better computing machines. The diode tubes, transistors, integrated circuits (ICs) and now very large integrated circuits (VLSI) are the electro-mechanical devices that have been invented over a period of time. The technology has improved since World War II many folds. The improved technology has been the key factor in making better computing devices. Along with improvement in computing technology, the communication technology has also improved in parallel. The software also improved and became user friendly. The spreadsheets, the word processing packages, database packages, simulation software packages, and decision support systems made IT popular among managers as well. The terms Information Systems (IS) and Information Technology (IT) are used synonymously. IS has evolved considerably since 1960.

#### **Activity A**

Give examples from day-today activities in your organization or any organization of your choice to support the statement, “Managers need only information and not data”.

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## **1.4 TYPES OF INFORMATION SYSTEM**

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There are various types of information systems as listed below.

### **Transaction Processing Systems (TPS)**

A TPS is used primarily for record keeping which is required in any organization to conduct the business. Examples of TPS are sales order entry, payroll, and shipping records etc. TPS is used for periodic report generation in a scheduled manner. TPS is also used for producing reports on demand as well as exception reports.

### **Decision Support System (DSS)**

DSS serves the management of an organization. A decision support system has sophisticated data analysis tools, which support and assist all aspects of problem specific decision-making. DSS may use data from external sources such as current stock prices to enhance decision-making. DSS is used when the problem is complex and the information needed to make the best decision is difficult to obtain and use. DSS is developed with the help of decision makers. DSS helps in decision-making process and does not make any decision.

### **Executive Information System (EIS)**

An Executive Information System is also called Executive Support System. Senior managers of an organization use the EIS. Therefore, it must be easy to use so that executives can use it without any assistance. EIS can do trend analysis, exception reporting and have drill down capabilities. The results are usually presented in a graphical form tailored to executive's information needs. EIS has on-line analysis tools and they access a broad range of internal and external data.

### **Management Information Systems (MIS)**

MIS provides the management routine summary of basic operations of the organization. The basic operations are recorded by the TPS of the organization and MIS consolidates the data on sales, production etc. MIS provides routine information to managers and decision makers. The main objective behind installing an MIS in the organization is to increase operational efficiency. MIS may support marketing, production, finance etc.

### **Work Flow System**

A workflow system is a rule based management system that directs, coordinates, and monitors execution of an interrelated set of tasks arranged to form a business process. A workflow system is also known as a document image management system. For example, a workflow system is used by banks for loan sanction process. An applicant fills out an electronic application form for a bank loan at a bank's web site. The application is then upload to the bank loan officer's site. The loan officer conducts an interview and fills in his feedback and passes the application form to the credit check unit. The credit unit checks the credit limit and fills in the details. The application is now complete and a final decision is made.

There are three types of workflow software. Administrative workflow systems focus on the tracking of expense reports, travel requests, massages. An Ad-hoc workflow system deals with the shaping of product, sales proposals, and strategic plans. Production workflow systems are concerned with mortgage loans and insurance claims. A workflow system may be Internet based and may be combined with e-mail. A workflow system may be based on client/sever architecture that may use a database/file server.

### **Enterprise Resource Planning (ERP)**

**ERP** system is a set of integrated programs capable of managing a company's vital business operations for an entire multi-site, global organization.

### **Expert Systems**

The system has the ability to make suggestions and act like an expert in a particular field.

An expert system has an extensive knowledge base.

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## 1.5 BUSINESS PERSPECTIVE OF IT

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The impact of IT on a business has been tremendous. One of the advantages of IT systems for a business is the cost-performance ratio, which is better in case of computers. The labor cost increases every year but the cost of computer does not increase. A better and more powerful computer can be bought for the same price after a year. It is better to use computers for routine jobs as far as possible. The IT has been used in every business and for every function of a business. Some of the applications are as follows.

- **Finance and Accounting :** IT has been used for forecasting revenues, determining the best sources and uses of funds and managing cash and other financial resources. IT has also been used to analyze investments and perform audits.
- **Sales and Marketing :** IT has been used to develop new services, which may not exist without IT. IT has helped management of various organizations to determine the best location for production and distribution facilities. The operational data has been analyzed using IT to determine the best advertising and sales approaches. The product prices have been set using IT to get the highest total revenues. In other words, IT has been used for product analysis and price analysis.
- **Manufacturing :** IT has been extensively used for processing customer orders, controlling inventory levels, developing production schedules and for monitoring product quality. A whole new discipline— Computer Aided Design and Computer Aided Manufacturing has evolved due to application of IT to design and manufacturing. The manufacturing is not what is used to be due to the use of computers, Computer Integrated Manufacturing (CIM) dominates the manufacturing sector.
- **Human Resource Management :** Companies are using IT systems for screening applicants and conducting various tests.
- **Project Management :** A range of software packages are available in the market for managing projects. These software products let the management set the schedules, milestones, facilitate communication among group members, and monitor the project progress. These products help in document and report preparation.
- **Data Analysis :** Investment firms heavily use information systems to analyze stocks, bonds and options to provide better service to their clients.

### Activity B

Give examples to highlight the applications of IT in

- Public Relations
- Market research
- Purchasing

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## 1.6 INTERNET AND ITS BUSINESS APPLICATIONS

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The network technology had been developed during 1970s. The network hardware and software improved as a result of research and investment. The network became a reality and every organization laid network cables and connected their computers and other resources to the network. Such a network is called Intranet. An Intranet is restricted to an organization. When a network of networks is formed, it is called Internet. In other words, Internet is a global network of computer networks. The Internet connects computing resources of various organizations such as academic institutes, business organizations and government organization. All networks, which are part of the Internet, follow a protocol called TCP/IP protocol for communication. Internet has affected business and people both. The Internet provides fast and inexpensive communication channels. The Internet is used for transferring data files, e-mail messages and for sharing documents and images. Internet is also used for chatting. There are news groups, which use Internet to share ideas. People, sitting miles apart, work on the same project making use of Internet to exchange ideas in real time. The Internet is also used for education and entertainment.

The Internet has changed the way business is done. A new business paradigm termed electronic commerce has come into existence. We will discuss e-commerce in some detail little later. Consumers are able to shop for goods and services from all over the world in the comfort of their homes. The individuals are able to shop, bank, work, and entertain themselves without leaving their homes. The payments are also made through Internet. The organizations, which provide these services, also use Internet. These organizations use Internet to conduct electronic meetings, train employees in many different locations simultaneously. The manufactures and corporate houses directly deal with the producers without going through the retailers. A large percentage of people are still not part of Internet. However, Internet users are increasing rapidly.

Internet has facilitated development of workflow systems across networks. As we have already discussed, workflow systems are business process automation tools that place system controls in the hands of user departments. They are very flexible and can be designed to automate almost any information-processing task. The primary purpose of workflow systems is to provide users with tracking, routing, document imaging, and other capabilities designed to improve business processes.

Teleconferencing, video conferencing and screen sharing are some of the other Internet applications. Tele-video conferencing save travel time and travel cost. The ideas can be shared quickly and the information flow is much faster. As a result, the product development time and contract negotiation time have reduced. The customer service has improved due to faster and accurate information availability. Many organizations have been able to draw competitive advantage by using Internet.

The Internet connects hundreds of thousands of different networks from more than 200 countries around the world. More than 400 million people from academics, business community and government organizations use the Internet. Uses of Internet vary from being a communication medium to providing a means for collaboration work.

The Internet is extremely robust. A system or a network can be added / deleted to the Internet without adversely affecting others on the Internet. The communication media used by Internet can be a telephone line, an Ethernet cable, or a microwave link. The Internet can carry data, images, text, voice, or transactions without any discrimination.

The Internet is being used by various organizations for collaborative work. These organizations use the Internet to send electronic mail, message, to transmit documents and data. The organizations are organizing and participating in electronic conferences.

Another popular use of Internet is to access information that others make available in public domain. There are special software package known as search engines, which help users locate the desired document. Large databases, electronic brochures, book details, and manuals are present on the Internet. Organizations advertise their products and services on the Internet.

Internet is also being used to participate in online discussions. These discussions are done in real time. An applicant can be interviewed online from a distant location. The candidate does not have to travel to appear for the interview. Apart from these obvious uses, the Internet is inspiring new business models, called digital firms. In digital firms, hierarchy and organizational levels are less compared to a traditional firm. The employees at lower-levels have access to more data and have more decision-making authority. The employees of an organization in a digital firm are not 9 to 5 people. They could be at location A and working for a digital firm at location B. These firms are much leaner and efficient than traditional firms.

Internet has immensely helped the field workers. In a traditional environment, a field worker had to go to his office to take orders for the day and report at the end of the day again to provide details of his accomplishments. An employee of a digital firm carries a laptop and enters the data into his laptop, which he transmits to his organization using a dial-up connection. He can attend meetings without actually traveling to his office.

The existing business processes have been thoroughly redesigned to take advantage of IT. A loan application in a traditional system takes about 2 weeks to get processed. A workflow system has reduced the time to less than a week. There is no paper movement and everybody can work on an application in parallel.

A company can use global data along with its operational data to respond to changes in the market place. A company works with much less inventory as it may easily co-ordinate production activities in the light of the orders. The products can be customized. The customization done to cater to the needs a very small segment is referred to as micro marketing.

Internet has also been used for electronic commerce. In Electronic Commerce (EC), business transactions take place via telecommunication networks. The business transactions may take place between an organization and consumers or between two businesses or organizations. The major benefits to the company include reduced cost, reduced cycle time, and improved customer service. Following is a list of benefits to an organization using electronic commerce.

- EC decreases the cost of creating, processing, distributing, storing, and reliving information.
- EC allows reduced inventories and overheads.
- EC reduces the time between the payments and receipts of goods and services.

EC enables an organization to operate in the areas much beyond their physical location.

E-commerce is the process of buying and selling goods and services electronically using Internet. The activities such as marketing, advertising, customer support, delivery, and payments are also done electronically. An e-business is supported by Internet within the organization.

One must keep in mind that e-commerce is a whole new business paradigm which needs fresh thinking. Just creating a web site doesn't guarantee success. Many people started e-business and failed. A sound e-business model is required. Some of the Internet business models are as follow:

Virtual storefront is an e-business where physical goods or services are sold online instead of an actual retail outlet. An example is [www.amazon.com](http://www.amazon.com), which sells book and other items online. A customer can select an item from their web site and place an electronic order. He can make payment through credit card and then the company delivers goods to him using traditional means. There are e-businesses whose prime business is to sell items where prices are not fixed. The prices are decided by the customers through auction. There are e-businesses who are content provider and manager. The companies where core competence is not IT, hire an IT company to create web sites and databases for them. Some companies provide portals to other organizations. A portal is a web site that provides an initial entry point to the web site of the company or other services e.g. Yahoo is a portal.

The e-commerce can also be classified based on the parties involved in the business. A business-to-consumer e-business involves an electronic retail home and customers. Such a business is also called B2C business, [www.amazon.com](http://www.amazon.com) is an example of B2C business. Business-to-business (B2B) involves transaction among businesses. The main advantage is that a business house can buy raw material and supplies from another business party without going through the retailer. [www.Milpro.com/](http://www.Milpro.com/) is an e-business, which sells machine tools to other businesses. In a consumer-to-consumer business (C2C), the e-business is a facilitator only. People are able to sell to other people using a C2C facility.

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## **1.7 COMPUTER AIDED DECISION MAKING**

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A decision system supports and assists all aspects of problem specific decision-making.

A decision support system (DSS), also called Computer Aided Decision System (CADS), is used when the problem is complex and the information needed to make the best decision is difficult to obtain and use.

In an organization, a manager has certain goals, which he tries to achieve through the use of resources. The resources such as people, money, material, and time is always limited. One of the roles that a manager plays among many others is of decision-making. The manager would like to examine various alternatives, which may not be possible in a manual system due to time constraint or due to sheer volume of data. Sometimes, a statistical analysis of fluctuating data is required which may be done only with the help of a decision support system. The data may be distributed over various branches of the organization and without the help of Information Technology; it may not be possible to examine the data.

An information system that helps a manager in making a decision is called a computer-aided decision support system (CADS) or simply decision support system (DSS). A DSS is designed with the help of decision makers. A DSS aids in decision-making process and does not make any decision. A DSS may be used for doing a thorough risk analysis of a project. Such a DSS performs what - if analysis. A DSS consists of a model of the real world, collection of facts- database, and a user interface.

An analyst talks to the manager and tries to establish his requirement. Analyst may need to interact with users many times before the requirements are completely understood. The analyst may also study the existing system if any. The analyst must have domain knowledge. The reality is examined, the problem is identified, and it is defined. The problem may be too complex to be analyzed. In such a situation, a simplified version of the problem is defined. The simplified problem is used to create a model of the actual problem. There are many ways of creating a model for a problem. The model may be a scale model, i.e. model of a building or a bridge. It may be a mathematical model such as equations describing the trajectory of a missile. The model may be an analog model such as a blue print for a building or a map to show a particular region. There are many other types of models, which are not discussed here. A model has a set of uncontrollable variables that are not under the control of the manager. There is a set of decision variables, which are under the control of the manager, and these variables describe alternative course of action. As the values assigned to decision variables are changed, the results also change. The result variables are dependent on decision variables.

The analyst then documents the requirements using one of the formal representations such as Data Flow Diagram, Flowcharts, ER diagram, structured English. Such a document is called Software Requirements Specification (SRS).

A system is then built according to the requirements. There are many software development models such as waterfall model, prototype, and incremental models. For a decision support system, usually a prototype is built which is shown to the manager for approval. The complete system is then built taking the feedback from the manager into consideration.

The decision variables are changed and impact on result variables is analyzed. A DSS provides support for decision makers by bringing together human judgment and computerized information. A DSS may provide support throughout large and complex organization or it may support an executive. A DSS may help an executive to perform trend analysis. A DSS may be designed to generate exception report so that the manager does not miss any exceptional condition.

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## 1.8 SUMMARY

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In this unit, we have learnt about the Information Systems. The terms Information Systems and Information Technology are used synonymously. We learnt a few definitions of IT. We also learnt the main components of an IT system. We also learnt various types of IT systems that are used in a business. The business applications of IT were discussed in some detail. Internet and E-commerce which is one of the applications of Internet were discussed. Various business models of e-business were also discussed. IT has also been used extensively in decision-making systems. These systems do not make any decisions by themselves but they only help the decision maker in analyzing the data.

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## 1.9 UNIT END EXERCISES

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1. Define an information system and list its major components.
2. Describe how information system can support a business.
3. Define the Internet, Intranet, and e-commerce.
4. Briefly describe various types of Information Systems.
5. What is the purpose of a TPS? How does it compliment MIS in an organization?
6. List the major advantages of the Internet. Briefly describe impact of Internet on business.
7. Write a note on e-commerce. What are the advantages of e-commerce over conventional business?
8. What is the purpose of a computer aided decision support system? What are the major components of such a system? How does it help the decision making process?

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## 1.10 REFERENCES AND SUGGESTED FURTHER READINGS

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Lauden, K. C. and Laudon, J. P., (2002) *Management Information Systems- Managing the Digital Firm*, Pearson Education.

Turban, E., McLean, E. and Wetherbee, J., (1999), *Information Technology for Management*, John Wiley, and Sons Inc. (Asia).

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## UNIT 2 COMPUTER SYSTEMS

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### Structure

- 2.1 Introduction
- 2.2 Objectives
- 2.3 Components of a Computer
- 2.4 Central Processing Unit (CPU)
- 2.5 Storage and Storage Devices
- 2.6 I/O Devices
- 2.7 Networking and Networking Devices
- 2.8 Plug and Play Devices
- 2.9 Communication Technology
- 2.10 Types of Computers
- 2.11 Summary
- 2.12 Unit End Exercises
- 2.13 References and Suggested Further Readings

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## 2.1 INTRODUCTION

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For an information system, hardware is defined as any machinery that helps in input, processing, storage, and output activities. Similarly for a computer, the hardware is the collection of devices that perform the functions of input, processing, data storage, and output. In other words, all physical units of a computer system constitute computer hardware. The input device gets the data from the outside world and the data is stored in the memory. The central processing unit (CPU) processes this data and the various output devices display the results. The components communicate with each other through system bus. Each hardware component plays an important role in computing. The arrangement of the component within the system even today is what was suggested in 1945 by Von Neumann and is known as Von Neumann architecture.

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## 2.2 OBJECTIVES

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After reading this unit you should be able to:

- Identify the components of a computer system;
- Describe the elements of a CPU;
- Explain the concept of networking; and
- Use plug and play devices

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## 2.3 COMPONENTS OF A COMPUTER

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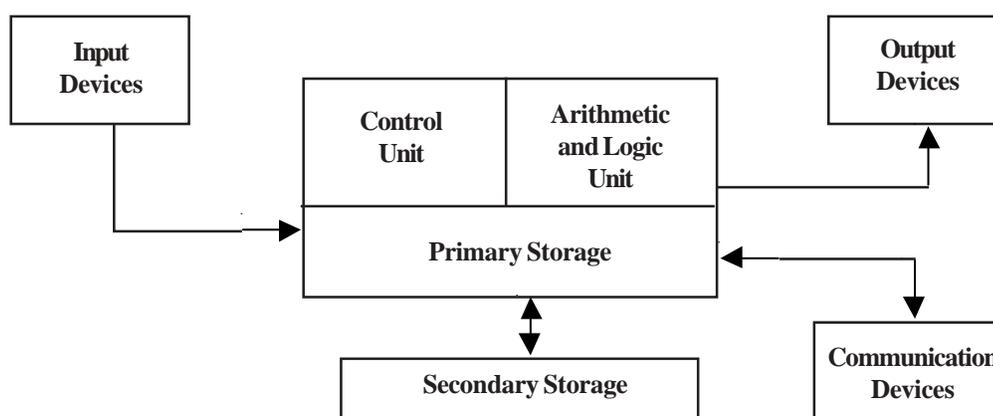


Fig. 2.1 : Components of a Computer

The computer memory is categorized into primary storage and secondary storage. Primary storage stores the data and programs during processing and secondary storage is used to store the data and programs for future use. Communication devices connect a computer to other computers and devices to facilitate data exchange with them.

Computers have been around since 1940s and have been evolving ever since. Computer hardware has evolved through four stages.

The so-called first generation (1946-1956) computer was built by vacuum tubes and programming was done by plugging and unplugging chords. The second-generation (1957-1963) computers had transistors. The third generation (1964-1979) computers had integrated circuits. The fourth generation (1979 onwards) systems use very large-scale integrated circuits. Along with the hardware technology, the software also improved in terms of being user friendly and capability. Every system has software as its integral part, which makes the computer work. The most important software is an operating system (OS), which performs two functions:

- Extend the machine - OS presents to the user an extended machine that is easier to program than the underlying hardware.
- Manage resources such as processor(s), memories, timers, disks, mouse, network, printer etc. OS provides an orderly and controlled allocation of the resources among the various programs competing for them.

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## **2.4 CENTRAL PROCESSING UNIT (CPU)**

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In order to work, a computer needs some sort of “brain”. At the core of each computer, there is a device called central processing unit (CPU), which is the brain of the computer. CPU reads the program from the main memory, and executes each step of the program, which may involve calculations and decision-making. The CPU is responsible for controlling all devices of the computer. It initiates a memory operation, which may involve reading data from an input device and storing it into memory or read data from the memory and display it on an output device.

The CPU mainly consists of three parts— Control Unit, Arithmetic Logic Unit (ALU), and Primary Storage (also referred to as Main Memory).

The ALU is the unit, which performs all mathematical calculations and logical operations. It performs addition, subtraction, multiplication, and division. It performs a logical operation by comparing two numbers. It can determine the smaller number, larger number or determine if the two numbers are equal. It can also determine whether a number is positive, negative or zero.

A program is a sequence of instructions. An instruction may be an arithmetic operation, a logical operation, an assignment, or a jump. The control unit sequentially accesses program instructions, decodes them, and directs ALU, Main Memory, input devices, and output devices so that the program instructions can be carried out. Execution of one program instruction may require control unit to issue many directives. The ALU may also perform many operations to complete one program instruction. Each operation performed by ALU and control unit is referred to as machine instruction. Each program instruction may involve many machine instructions. A single machine instruction is completed in a machine cycle. The number of machine instructions completed in a second is called the speed of the CPU and it is measured in MIPS (Millions of instructions per second). A CPU also contains a set of registers, which are specialized, small, high-speed memory for storing temporary results of ALU and for storing control information.

The word length of a CPU is the number of bits it can process in a single cycle. A 64-bit machine can process 64 bits in a single cycle. A 64-bit machine is faster than a 32-bit machine.

The cycle is defined by the internal clock of the control unit. The Pentium based systems have a clock speed of 1GHz or more whereas 3 years ago the speed used to be 300 MHz. The bus carries data, control signals, and address in a system. If the data bus width is same as the word length, then one word can be moved at a time. If the bus width is half of word length, two cycles are required for moving one word.

The instruction set also affects the speed. If the instruction set is simple, as in RISC, one or more instructions may get executed in each cycle. There will be some long instructions, which take more than one cycle. It is possible that a given application extensively uses long instructions (such as scientific computing) and the machine will appear to be slow.

There is no direct relationship between clock frequency and the speed of a system. There are benchmark programs that are run to establish the speed of a computer system.

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## 2.5 STORAGE AND STORAGE DEVICES

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The large amount of data is stored on a computer using various types of storage media. The storage media are distinguished by their relative speed, capacity, and resilience to failure.

- 1) **Volatile Storage:** Information residing in such storage needs continuous power supply. The contents are lost if power supply is switched off. Examples of such storage devices are main memory and cache memory, which we will discuss in the next section. Access to volatile storage is very fast, both because of the technology used and because of the access method.
- 2) **Nonvolatile Storage:** The nonvolatile storage media do not require power supply to retain their contents. Examples of such storage media are disks and magnetic tapes. Disk is used for online storage, while tapes are used for archival storage. Disks and magnetic tapes are very reliable storage media. The current technology used for nonvolatile storage makes them much slower than volatile storage.

### Main Memory

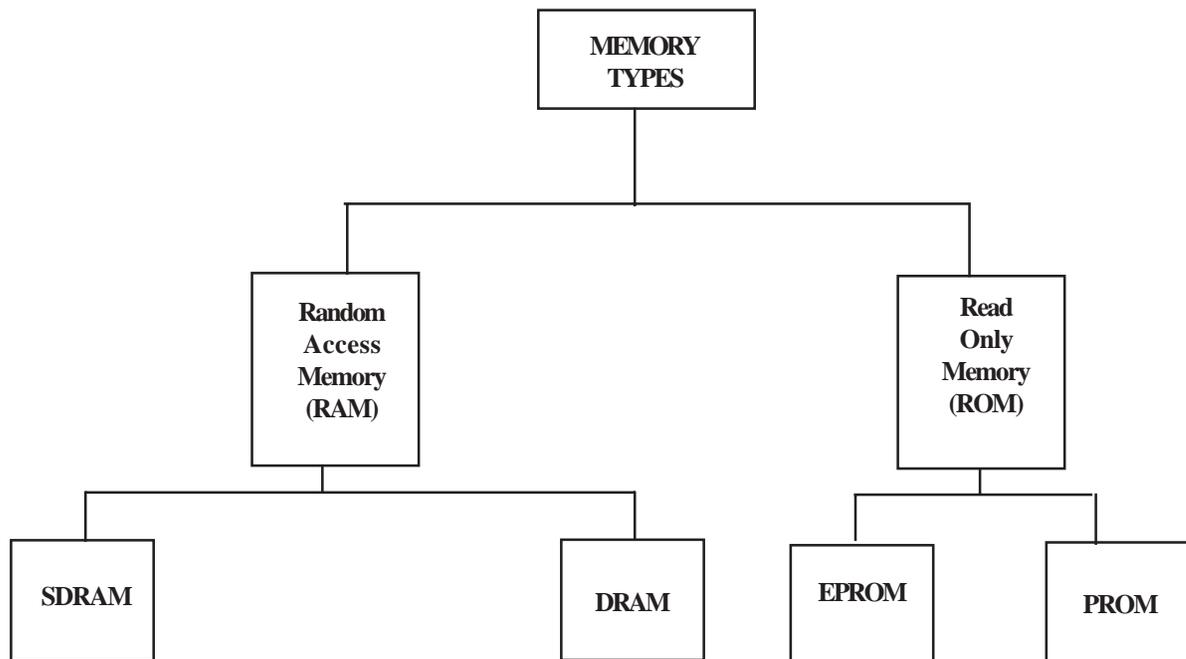
Main memory holds the programs and data required by the CPU for carrying out its operations. The primary storage is a semiconductor device that is built using integrated circuits. The data is stored in binary form by main memory. Numeric as well as non-numeric data can be represented in binary form. With two binary digits, we can represent 4 different characters. With three binary digits, we can represent 8 different characters. Computers internally use eight binary digits to represent characters and digits (A binary digit is referred to as bit and 8 bits are called a byte). 256 characters can be represented by a byte. The main memory consists of many thousands of bytes. The table given below lists commonly used names, abbreviations and the number of bytes for storage capacity.

**Table 2.1: Commonly Used Names and Abbreviations for Storage Capacity**

Name	Abbreviation	Number of Bytes
Byte	B	1
Kilobyte	KB	1,024
Megabyte	MB	1,024 * 1,024 (about one million)
Gigabyte	GB	1,024 * 1,024 * 1,024
Terabyte	TB	1,024 * 1,024 * 1,024 * 1,024

**Types of Main Memory**

Memory can be of various types like Random Access Memory (RAM) and Read-Only Memory (ROM). The figure 2.2 given below gives a description of the memory types.

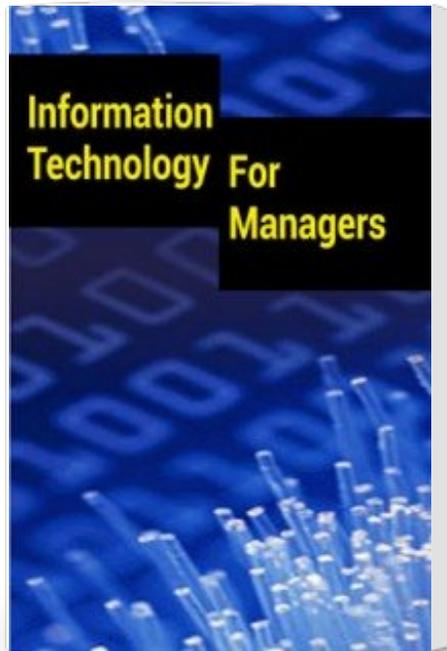


**Fig. 2.2: Types of Memory**

RAM has become the synonym for main memory. 20 years ago, the word core memory was used for referring to main memory. RAM is the memory access method and core memory was the technology used in main memory. The core memory technology is not used any more. RAM is an acronym for random access memory. As the name suggests, any location of the memory can be accessed randomly and the access time to is independent of the location. We will continue to use word RAM to refer to main memory. RAM is very fast; the access time is in nano seconds. RAM is volatile that is the contents of RAM are lost when the power supply to the RAM is discontinued.

DRAM (Dynamic Random Access Memory) is the most common kind of RAM. The data is stored in the cell of transistors and capacitors and the data has to be refreshed every few milliseconds. SRAM (Static Random Access Memory) does not require periodical refresh. SRAM is faster than DRAM but is more expensive as compared to DRAM.

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