**CHAPTER FIVE: TECHNICAL FOUNDATIONS OF INFORMATION SYSTEMS**

After completing this chapter, you will be able to:

* Describe computers and information processing
* Describe information systems software
* Understands the concept of managing data resources
* Describe the technology of communication, networks
  1. **What is a computer system?**

Regardless of size, age, function or capability, all computers have the same basic components and operate according to the same basic principles. A computer must handle fours basic operations: accept data, store data and instructions, process data and lastly output data. In recent years, almost every computer has also been expected to support data communications. Computers conduct these operations with the same basic equipment. In general, every computer has these components:

* *Central processing unit (CPU)* is the most important part of any computer. It manipulates raw data into a more useful form and controls the other parts of the computer systems. Two main unit of CPU is *arithmetic logic unit (ALU)* that performs the principles logic and arithmetic operations of the computer and *control unit* that controls and coordinates the other parts of the computer system.
* *Primary storage that s*tores all or part of the program that is being executed, stores the operating system programs that manage the operation of the computer and holds data that are being used by the program. Internal primary storage of a computer is often called RAM (Random Access Memory) and can directly access any randomly chosen location in the same amount of time. Besides RAM, ROM (Read Only Memory) is also used to store important or frequently used programs and it comes with manufacturer when a computer is purchased. ROM can be further divided into two subclasses:
* Programmable read-only memory (PROM) which is used in control devices because it can be reprogrammed once.
* Erasable programmable read-only memory (EPROM) that can be erased and reprogrammed many times.
* *Secondary storage is a r*elatively long-term, nonvolatile storage of data outside the CPU and primary storage. It can be divided into three different categories:
* *Magnetic disk*which can be divided further into two main type, floppy disks and hard disks. Floppy disk is a removable magnetic disks storage primarily used with PCs. Hard disk is a magnetic tape resembling a thin steel platter with an iron oxide coating and is used in large computer systems and in many PCs.
* *Optical disk* is also called compact disks or laser optical disks. It stores data at densities many times greater than those of magnetic disks. Compact disks read-only memory (CD-ROM) is a read-only optical disks storage used for imaging, reference a database applications with massive amounts of unchanging data and for multimedia. Write once/read many (WROM) or Compact disk-recordable (CD-R) is an optical disk system that allows users to record data only once and data cannot be erased but can be read indefinitely. *Magnetic Tape* in an inexpensive, older secondary storage medium in which large volumes of information are stores sequentially by means of magnetized and non-magnetized spots on tape.
* *Input and output devices/peripheral devices. Input devices* converts data and instructions into electronic from for input into the computer. Examples of input devices are like keyboard, computer mouse, touch screens and etc. *Output devices* convert electronic data produces by the computer system and display them in a form that people can understand. Examples of output devices are like printer, video display and etc.

**5.2 Information Systems Software**

**Software is a detailed instruction that control the operation of a computer system.** Without software, computer hardware could not perform the tasks we associate with computers. The main functions of software are managing the computer resources of the organization, provide tools for human beings to take advantage of these resources and act as an intermediary between organizations and stored information. *Software program* is a series of statements or instructions to the computer. A stored program concept means that a program must be stored in the computer’s primary storage along with the required data in order to execute, or have its instructions performed by the computer. Software can be divided into two major types:

* *System software* is a generalized program that manages the resources of the computer. O*perating system* is the system software that manages and controls computer’s activities. An operating system performs three main functions: allocation and assignment, scheduling and the last one is monitoring.
* *Application software* is programs written for a specific application to perform functions specific by end users. Application software works through system software, which access to computer hardware.

**5.3 Managing data resources**

**5.3.1 Problems with traditional file environment**

Traditional file environment (flat file organization/data file organization) is a way of collecting and maintaining data in an organization that leads to each functional area or division creating and maintaining its own data files and programs. Traditional file environment will results the following problems:

* Data redundancy and confusion.
* Program-data independence.
* Lack of flexibility.
* Poor security.
* Lack of data sharing and availability.

The above mentioned problems can be solved by using a database.

* + 1. **Database environment**

Database is a collection of data organized to service many application at the same time by storing and managing data so that they appear to be in one location. A database management system (DBMS) is special software to create and maintain a database and enable individual business applications to extract the data they need without having to create separate files or data definitions in their computer programs. A DBMS has three components:

* A data definition language.
* A data manipulation language.
* A data dictionary.

**5.3.3 Three major types of database models**

The earliest DBMS were *hierarchical* which organizes data in a treelike structure. A record is subdivided into segments that are connected to each other in one-to-many parent-child relationship. The most common hierarchical DBMS is IBM’s IMS (Information Management System). The *network data model* is a variation of the hierarchical data model. This model is useful for depicting many-to-many relationships. *Relational data model* is a type of logical database model that treats data if they were stored in two-dimensional tables. It can relate data stored in one table to data in another as long as the two tables share a common data element. *Object relational data model* is a model used mostly for Internet databases. The following table shows the comparison of database alternatives.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Types of database** | **Processing efficiency** | **Flexibility** | **End-user friendliness** | **Programming complexity** |
| Hierarchical | High | Low | Low | High |
| Network | Medium-high | Low-medium | Low-moderate | High |
| Relational | Lower but improving | High | High | Low |

**5.4 Telecommunications and Networks**

**5.4.1 Components and functions of a telecommunication system**

A telecommunication is a collection of compatible hardware and software arranged to communicate information from one location to another. The following are essential components of telecommunication systems:

* Computers to process information.
* Terminals or any input/output devices that send or receive data.
* Communication channels, the links by which data or voice are transmitted between sending and receiving devices in a network. Communication channels use various communication media, such as telephone lines, fiber-optics cables, coaxial cables and wireless transmission.
* Communication processors, such as modems, multiplexers, controllers and front-end processors, which provide support functions for data transmission and reception.
* Communication software, which controls input and output activities and manages other functions of the communication network.

Functions of telecommunication system:

* Establishes the interface between the sender and the receiver.
* Routes messages along the most efficient paths.
* Performs elementary processing of the information to ensure that the right message gets to the right receiver.
* Performs editorial tasks on the data.
* Converts messages from one speed into the speed of a communications line or from one format to another format.
* Controls the flow of information.

**5.4.2 Communication Networks**

Networks can be classified by their shape (topology) or by their geographic scope and type of services provided. Networks classified by their topology:

* *Star network* is a network in which all computers and other devices are connected to a central host computer. All communications between networks devices must pass through the host computer.
* *Bus network* is a topology that links a number of computers by a single circuit with all messages broadcast to the entire network.
* *Ring network* is a network in which all computers are linked by a closed loop in a manner that passes data in one direction from one computer to another.

Networks classified by their geographic scope:

* *Private branch exchanges (PBX)* is a central switching system that handles a firm’s voice and digital communication.
* *Local area networks (LAN)* is a telecommunication network that requires its own dedicated channels and that encompasses a limited distance, usually one building or several buildings in close proximity.
* *Wide area networks (WAN)* is a network that spans a large geographical distance. May consist of a variety of cables, satellite and microwave technology.
* *Value-added network (VAN)* is a private, multi-path, data-only, third-party managed network that is used by multiple organizations on a subscription basis.