# Unit – I

## DATA, INFORMATION & SYSTEM

**Data** – Raw facts (unprocessed data) & figure are known as data. Data is a plural of datum (a single piece of information). Data is a set of characters or symbols like numeric, alphabetic or alphanumeric, audio, video, images or any combination of these that has no meaning or no value by itself and cannot help in decision-making.

**Information** – Processed data is known as information. It is defined as data put into understandable, meaningful, useful and communicated to the recipient who takes decision on it. When information is packaged or used for understanding or doing something, it is known as knowledge.

**System** – System is set of components which interact with each other to accomplish a specific goal. System could also be considered as an integrated set of resources working together to convert input in output. Each individual component of the system which shares some or all the characteristics of system is called subsystem. Every system consists of subsystem and each subsystem is a system in itself. The world outside the system is environment. Examples are:

1 Human body and its subsystem could be nervous system, digestive system and cardiac system etc

2 Computer systems and it have various subsystems like ALU, CU, Memory, Input unit and Output unit etc.



## CHARACTERISTICS OF SYSTEM

- Every system has a purpose.
- Every system is made up of components like input process output, feedback and control etc.
- System is made up of subsystem, whose goals are referred to as sub goals.
- Goal of a system is more important then subsystem goal.
- Systems whether open or closed have an element of control associated with them.

## **INFORMATION SYSTEM:**

An information system is a software system to capture, transmit, store, retrieve, manipulate, or display information, thereby supporting people, organizations, or other software systems.

For example: A patient who consults a family doctor usually first tells the doctor about the symptoms. With this information, the doctor examines the patient and makes a diagnosis. Afterward, the doctor determines the treatment to heal the patient. For example, based on the diagnosis, the doctor may write the patient a prescription for some medication. Finally, the doctor must document the symptoms, the diagnosis, and the treatments. Today most doctors use a software system to record this information.

## **INFORMATION CONCEPT:**

The main object of an information system is to provide information to its users. Information systems vary according to the type of users who use the system. Information systems are a set of people, procedure and resources that collects, transforms and disseminates information in an organization.

## **COMPONENTS OF INFORMATION SYSTEMS:**

While information systems may differ in how they are used within an organization, they typically contain the following components:

- 1. Hardware: Computer-based information systems use computer hardware, such as processors, monitors, Keyboard and printers.
- 2. Software: These are the programs used to organize process and analyze data.
- 3. Databases. Information systems work with data, organized into tables and files.
- 4. **Network:** Different elements need to be connected to each other, especially if many different people in an organization use the same information system.

5. **Procedures:** These describe how specific data are processed and analyzed in order to get the answers for which

the information system is designed.

#### **TYPES OF INFORMATION SYSTEM:**

In 1980 was of a pyramid of systems that reflected the hierarchy of the organization, usually transaction processing systems at the bottom of the pyramid, followed by management information systems, decision support systems, and ending with executive information systems at the top. Although the pyramid model remains useful, since it was first formulated a number of new technologies have been developed and new categories of information systems have emerged, some of which no longer fit easily into the original pyramid model. Some examples of such systems are:

- data warehouses
- enterprise resource planning
- enterprise systems
- expert systems
- search engines
- geographic information system
- global information system
- Office automation.

### SYSTEM & MODELING CONCEPT:

Set of ideas, concepts, models, and procedures appropriate to information manufacturing systems that can be used to determine the quality of information products delivered or transferred to information customers. These systems produce information products on a regular or as-requested basis. The model systematically tracks relevant attributes of the information product such as timeliness, accuracy and cost. This is facilitated through information manufacturing analysis matrix that relates data units and various system components. Measures of these attributes can then be used to analyze potential improvements to the information manufacturing system under consideration.

Systems modeling or system modeling is the <u>interdisciplinary study</u> of the use of <u>models</u> to conceptualize and construct <u>systems</u> in <u>business</u> and <u>IT development</u>. A common type of systems modeling is <u>function modeling</u>, with specific techniques such as the <u>Functional Flow Block Diagram</u> and <u>IDEF0</u>. These models can be extended using <u>functional decomposition</u>, and can be linked to <u>requirements</u> models for further systems partition.

Contrasting the functional modeling another type of systems modeling is <u>architectural modeling</u> which uses the <u>systems architecture</u> to conceptually model the <u>structure</u>, <u>behavior</u>, and more <u>views</u> of a system.

The <u>Business Process Modeling Notation</u> (BPMN), a graphical representation for specifying business processes in a workflow, can also be considered to be a systems modeling language.

In business and IT development the term "systems modeling" has multiple meaning. It can relate to:

- the use of <u>model</u> to conceptualize and construct systems
- the <u>interdisciplinary study</u> of the use of these models
- the systems modeling, <u>analysis</u>, and <u>design</u> efforts
- the systems modeling and <u>simulation</u>, such as <u>system dynamics</u>
- any specific systems modeling language

As a field of study systems modeling has emerged with the development of <u>system theory</u> and <u>systems sciences</u>. As a type of <u>modeling</u> systems modeling are based on <u>systems thinking</u> and the systems approach. In business and IT systems modeling contrasts other approaches such as:

- agent based modeling
- <u>data modeling</u> and
- <u>mathematical modeling</u>

## **MEANING OF INFORMATION SYSTEM:**

An information system (IS) is a system composed of people and computers that processes or interprets information. The term is also sometimes used in more restricted senses to refer to only the software used to run a computerized database or to refer to only a computer system.

An information system commonly refers to a basic computer system but may also describe a telephone switching or environmental controlling system. The IS involves resources for shared or processed information, as well as the people who manage the system. People are considered part of the system because without them, systems would not operate correctly.

There are many types of information systems, depending on the need they are designed to fill. An operations support system, such as a transaction processing system, converts business data (financial transactions) into valuable information. Similarly, a management information system uses database information to output reports, helping users and businesses make decisions based on extracted data.

In a decision support system, data is pulled from various sources and then reviewed by managers, who make determinations based on the compiled data. An executive information system is useful for examining business trends, allowing users to quickly access custom strategic information in summary form, which can be reviewed in more detail.

## **BUSINESS INFORMATION SYSTEM:**

Information processing has transformed our society in numerous ways. From a business perspective, there has been a huge shift towards increasingly automated business processes and communication. Access to information and capability of information processing has helped in achieving greater efficiency in accounting and other business processes.

A complete business information system, accomplishes the following functionalities:

- Collection and storage of data.
- Transform these data into business information useful for decision making.
- Provide controls to safeguard data.
- Automate and streamline reporting.

The following list summarizes the five main uses of information by businesses and other organizations:

• **Planning** - At the planning stage, information is the most important ingredient in decision making. Information at planning stage includes that of business resources, assets, liabilities, plants and machineries, properties, suppliers, customers, competitors, market and market dynamics, fiscal policy changes of the Government, emerging technologies, etc.

- **Recording** Business processing these days involves recording information about each transaction or event. This information collected, stored and updated regularly at the operational level.
- **Controlling** A business need to set up an information filter, so that only filtered data is presented to the middle and top management. This ensures efficiency at the operational level and effectiveness at the tactical and strategic level.
- **Measuring** A business measures its performance metrics by collecting and analyzing sales data, cost of manufacturing, and profit earned.
- **Decision-making** MIS is primarily concerned with managerial decision-making, theory of organizational behavior, and underlying human behavior in organizational context. Decision-making information includes the socio-economic impact of competition, globalization, democratization, and the effects of all these factors on an organizational structure.

### SYSTEM DEVELOPMENT:

The Information Systems Development Methodology (ISDM) is designed to provide a consistent, repeatable process for developing systems. By referencing, utilizing and applying the techniques within this methodology, development teams have a standard framework necessary to efficiently and effectively scope a project, conduct analysis, define and design the solution, create the system modules and evaluate the system after its implementation. The ISDM is a living document with a built-in anticipation of continued growth and evolution parallel to the changing industry practices. This methodology will be properly enforced, and is intended for all system development efforts.



The information systems department is also referred to as the information technology department. It is responsible for running, maintaining, and developing the computers and information systems in an organization. They also make sure for the programs to run smoothly. It includes all the computer and network personnel of that organization. The IT person that is most involved in system development is the system analyst. The system analyst manages the things related to designing and implementing modified systems. A person that is very important to system development is the business analyst.

The System Development Life Cycle (SDLC) is composed of six steps.

- 1. preliminary investigation
- 2. system analysis
- 3. system design
- 4. system acquisition
- 5. system implementation

### 6. system maintenance

- 1. **Preliminary Investigation:** The main point of doing a preliminary investigation is to determine what problems need to be fixed and what is the best way to go about solving those problems, if solutions do in fact exist.
- 2. **System Analysis:** system analysis is used to investigate the problem on a larger scale and fine tune all the information a company has on the issue. Data collection and analysis are the two main points of interest inside system analysis. Gathering information about the current system and users allows analysts to develop an idea of what seems to be the real problem and how they should go about fixing it through data analysis.
- 3. System Design: After all of the data has been analyzed, it is time to design a blueprint for the system that specifies what it will look like and how it will work. First you have to develop the design by using a few key tools. One important tool is the creation of a *data dictionary*, which describes the characteristics of all data that is used in a system.
- 4. **System Acquisition**: Once the design blueprint has been approved, it's off to the proverbial grocery store. The organization needing a system will have a set budget and a list of components needed to make their system work properly. With this budget come a few courses of action. The first thing to think about is whether the company should create their own software for their system or buy the software from others. It is typically cheaper and less time consuming to buy preexisting software but the customization options are limited. If the preexisting software doesn't offer the options required of the system blueprint, then the company will likely have to make custom software to meet their needs.
- 5. **System Implementation:** In this step, users get the old data ready to be moved, called data migration. Once that is complete, they can begin installing new hardware and software. There are four ways of converting data to new a system:
  - a) Direct conversion: The old system is deactivated and the new one is implemented right away.
  - **b) Parallel conversion:** Both systems are operated at the same time until it is known that the new one is working then the old one gets deactivated.
- 6. **System Maintenance:** The system maintenance is the ongoing process throughout the life of the system. Maintenance can include updating software or updating what is already installed. Many of you play an active role in this step already. For example how many of you keep up with the newest updates for your Apple applications? You are taking part in system maintenance.

## NEED TO LEARN INFORMATION SYSTEM:

Information systems, also known as IS or CIS in the case of Computer Information Systems is the study of computer hardware and software that people, organizations, and businesses use to collect, create, process, and distribute data. Through an education in IS you will learn both business and computer science. CIS is more specifically geared towards computers and algorithmic processes, whereas IS deals with functionality of computers rather than design.

## **ORGANIZATION AND INFORMATION SYSTEM:**

An organization is a stable, formal social structure that takes resources from the environment and processes them to produce outputs. This technical definition focuses on three elements of an organization. Capital and labor are primary production factors provided by the environment.



Information systems and organizations influence one another. Information systems are built by managers to serve the interests of the business firm. At the same time, the organization must be aware of and open to the influences of information systems to benefit from new technologies. The interaction between information technology and organizations is complex and is influenced by many mediating factors, including the organization's structure, business processes, politics, culture, surrounding environment, and management decisions

### **COMPETITIVE ADVANTAGES/ STRATEGY:**

### 1. Cost leadership strategy:

The goal of cost leadership strategy is to offer products or services at the lowest cost in the industry. The challenge of this strategy is to earn a suitable profit for the company, rather than operating at a loss and draining profitability from all market players. Companies such as Wal-Mart succeed with this strategy by featuring low prices on key items on which customers are price-aware, while selling other merchandise at less aggressive discounts. Products are to be created at the lowest cost in the industry. An example is to use space in stores for sales and not for storing excess product.

## 2. Differentiation strategy:

The goal of differentiation strategy is to provide a variety of products, services, or features to consumers that competitors are not yet offering or are unable to offer. This gives a direct advantage to the company which is able to provide a unique product or service that none of its competitors is able to offer. An example is Dell which launched mass-customizations on computers to fit consumers' needs. This allows the company to make its first product to be the star of its sales.

#### 3. Innovation strategy:

The goal of innovation strategy is to leapfrog other market players by the introduction of completely new or notably better products or services. This strategy is typical of technology start-up companies which often intend to "disrupt" the existing marketplace, obsolescing the current market entries with a breakthrough product offering. It is harder for more established companies to pursue this strategy because their product offering has achieved market acceptance. Apple has been a notable example of using this strategy with its introduction of iPod personal music players, and iPad tablets. Many companies invest heavily in their research and development department to achieve such statuses with their innovations.

#### 4. Operational effectiveness strategy:

The goal of operational effectiveness as a strategy is to perform internal business activities better than competitors, making the company easier or more pleasurable to do business with than other market choices. It improves the characteristics of the company while lowering the time it takes to get the products on the market with a great start.

### **PERFORMANCE BASED INFORMATION SYSTEM:**

Performance-based systems, while necessary to allow the use of innovative technologies are not by themselves sufficient to encourage the development and deployment of innovative technologies. In fact if not designed and implemented properly as complete systems. Performance - based contracts and regulations must be designed and implemented as part of a flexible, comprehensive program including early and continuous collaboration with stakeholders, common and clear goal setting, incentives for innovation and use of innovative technologies, and a willingness to make changes together as the project proceeds.

### **CAREERS IN INFORMATION SYSTEM:**

Information Systems (IS) deals with the use of information technologies in businesses and organizations. Organizations will thrive only if they effectively make use of, design, and implement information systems to meet the organization's tactical and strategic needs. Successfully managing the development and use of information systems presents a difficult challenge, given the rapid pace of technological change.

- 1. **Network Engineers and Administrators:** Responsible for the maintenance of computer hardware and software, including deploying, configuring, maintaining, and monitoring active data network or converged infrastructure environments and related network equipment.
- 2. **Software Engineers:** Responsible for design, development, operation, and maintenance of software, and the study of these approaches.

3. Systems Analysts, Integrators, or Designers: Responsible for designing and developing new systems, solving

challenging computer-related problems, and integrating systems to improve efficiency and effectiveness.

- 4. Database Managers or Administrators: Responsible for the installation, configuration, upgrade,
- administration, monitoring, and maintenance of databases in an organization.
- 5. **Interface Specialists:** Provide advanced integration, workflow, and reporting capabilities that improve productivity and financial performance.
- 6. **Product Support Professionals:** Responsible for setting up and maintaining websites, solving network problems, and fixing hardware problems.
- 7. **Programmers and Programming Analysts:** Responsible for writing computer software, and can refer to a specialist or to a generalist who writes code for many kinds of software.
- 8. **Knowledge Officers:** Responsible for managing intellectual capital and can help an organization maximize the returns on investment in knowledge, including people, processes, and intellectual capital.
- 9. Information Officers: Responsible for the information technology and computer systems that support enterprise goals.
- 10. **Managers of Information Systems:** Plan, coordinates, and directs computer-related activities in an organization and implement appropriate computer systems to meet organization goals.
- 11. Academic Researchers or Information System Educators: Research covers the development of IT-based services, the management of IT resources, and the use, impact, and economics of IT with managerial, organizational, and societal implications, as well as professional issues affecting the IS field.
- 12. **IT Consultants:** Advise businesses on how best to use information technology to meet their objectives, and often estimate, manage, implement, deploy, and administer IT systems on behalf of the business.

#### Unit II

#### Hardware : COMPONENTS:

Computer hardware is the collection of physical elements that constitutes a computer system. Computer hardware is the physical parts or components of a computer, such as the monitor, mouse, keyboard, computer data storage, hard disk drive (HDD), system unit (graphic cards, sound cards, memory, motherboard and chips) and so on. All of which are physical objects that can be touched (that is they are tangible).



Computers are made of the following basic components:

- 1. **Case** with hardware inside:
  - i. **Power Supply** The power supply comes with the case, but this component is mentioned separately since there are various types of power supplies. The one you should get depends on the requirements of your system. This will be discussed in more detail later
  - ii. **Motherboard** This is where the core components of your computer reside which are listed below. Also the support cards for video, sound, networking and more are mounted into this board.
    - a) **Microprocessor** This is the brain of your computer. It performs commands and instructions and controls the operation of the computer.
    - b) **Memory** The RAM in your system is mounted on the motherboard. This is memory that must be powered on to retain its contents.
    - c) **Drive controllers** The drive controllers control the interface of your system to your hard drives. The controllers let your hard drives work by controlling their operation. On most systems, they are included on the motherboard; however you may add additional controllers for faster or other types of drives.
  - iii. **Hard disk drive(s)** This is where your files are permanently stored on your computer. Also, normally, your operating system is installed here.
  - iv. **CD-ROM drive(s)** This is normally a read only drive where files are permanently stored. There are now read/write CD-ROM drives that use special software to allow users to read from and write to these drives.
  - v. **Floppy drive(s)** A floppy is a small disk storage device that today typically has about 1.4 Megabytes of memory capacity.
  - vi. Other possible file storage devices include DVD devices, Tape backup devices, and some others.

- 2. **Monitor** This device which operates like a TV set lets the user see how the computer is responding to their commands.
- 3. Keyboard This is where the user enters text commands into the computer.
- 4. Mouse A point and click interface for entering commands which works well in graphical environments.

### **PROCESSING AND MEMORY DEVICE:**

When a computer receives data from an input device, the information must go through an intermediate stage before it can be output to your monitor, speakers or printer. A processing device is any device in a computer that handles this intermediate stage; responsible for controlling the storage and retrieval of information. Common examples of processing devices include a computer's motherboard, central processing unit, graphics processing unit, network card, and sound card.

#### **SECONDARY STORAGE:**

External memory or secondary memory or auxiliary storage, a secondary storage device is any non-volatile medium that holds data until it is deleted or overwritten. Secondary storage is about two orders of magnitude cheaper than primary storage.

## 1. Hard Disk:

A Hard Disk Drive (HDD) also hard drive or hard disk is a non-volatile. The hard disk is the primary storage unit of the computer. A hard disk consists of a stack of disk platters that are made up of aluminum alloy of glass coated with a magnetic material.



The surface of a disk is divided into imaginary tracks and sectors. Tracks are concentric circles where the data is stored. These tracks are numbered from the outermost ring to the innermost ring, starting from zero. Disk sectors refer to the number of fixed size areas that can be accessed by one of the disk drive's read/write heads, in one rotation of the disk, without the head having to change its position. An intersection of a track and a disk sector is known as track sector. Each sector is uniquely assigned a disk address before a disk drive can access a piece of data. In order to make the disk usable, first it must be formatted to create tracks and sectors. The track sectors are grouped into a collection known as cluster. It refers to the basic allocation unit for storage on a disk. The operating system, software titles and most other files are stored in the hard disk drive. The hard drive is sometimes referred to as the "C drive" due to the fact that Microsoft Windows designates the "C" drive letter to the primary partition on the primary hard disk drive in a computer by default. While this is not a technically correct term to use, it is still common. For example, some computers have multiple drive letters (i.e. C, D, E) representing areas across one or more hard drives. The desktop hard disk drive has six components: the head actuator, read/write actuator arm, read/write head, spindle, and platter. On the back of a hard disk is a circuit board called the disk controller? Data sent to and from the hard disk is interpreted by the disk controller, which tells the hard disk what to do and how to move the components in the drive. When the operating system needs

to read or write information, it checks the File Allocation Table (FAT) of the hard disk to determine file location and available areas. Once this has been checked, the disk controller instructs the actuator to move the read/write arm and align the read/write head. Because files are scattered throughout the platter, the head will often need to move to several different locations to access all information.

All information stored on a traditional hard drive, like the above example, is done magnetically. After completing the above steps, if the computer needs to read information from the hard drive it would read the magnetic polarities on the platter. One side of the magnetic polarity is 0 and the other is 1, reading this as binary data the computer can understand what the data is on the platter. For the computer to write information to the platter, the read/write head aligns the magnetic polarities, writing 0's and 1's that can be read later.

#### 2. Floppy Disk Drives:

In 1971, IBM introduced the first "memory disk", as it was called then, or the "floppy disk" as it is known today. The size was of 8-inch. The "floppy" was invented by IBM engineers led by Alan Shugart.

The first floppy was an 8-inch flexible plastic disk coated with magnetic iron oxide; computer data was written to and read from the disk's surface. In 1976, the 5 1/4"(5.25 inch) flexible disk drive and diskette was developed by Alan Shugart for Wang Laboratories. In 1981, Sony introduced the first 3 1/2" floppy drives and diskettes. These floppies were encased in hard plastic; however, the name stayed the same. They stored 400kb of data, and later 720K (double-density) and 1.44MB (high-density).

A floppy disk is a portable, inexpensive storage medium that consists of a thin, circular, flexible plastic disk with a magnetic coating enclosed in a square-shaped plastic shell. A floppy disk drive (FDD) is a device that can read from and write on a floppy disk. When you insert a floppy disk into a floppy disk drive, a shutter on the disk's plastic shell slides to the side to expose the disk's recording surface. A floppy disk is a type of magnetic media because it uses magnetic patterns to store items. Data is stored in tracks and sectors. A track is a narrow recording band that forms a full circle on the surface of the disk. The disk's storage locations consist of pie-shaped sections, which break the track into small arcs called sectors. For reading and writing purposes, sectors are grouped into clusters. A cluster consists of two to eight sectors and is the smallest unit of space used to store data. Formatting is the process of preparing a disk for reading and writing.

## 3. Optical Disc/Optical Disc Drives:

Optical disk is any storage media that holds content in digital format and is read using a laser assembly is considered optical media. The most common types of optical media are Blu-ray, CDs, and DVDs. Computers can read and write to CDs and DVDs using a CD Writer or DVD Writer drive, and a Blu-ray is read with a Blu-ray drive. Drives such as a CD-R and DVD-R drive that can read and write information to discs are known as magneto-optic (MO).



There are three main types of optical media: CD, DVD, and Blu-ray disc. CDs can store up to 700 megabytes (MB) of data and DVDs can store up to 8.4 GB of data. Blu-ray discs, which are the newest type of optical media, can store up to 50 GB of data.

An optical disk is a compact disc or CD. Its formatting will dictate whether it is a DVD, CD, read-only or rewritable. They have replaced vinyl records, cassette tapes, videotapes and floppy disks.

The optical disk became the preferred medium for music, movies and software programs because of its many advantages. Compact, lightweight, durable and digital, they also provide a minimum of 650 megabytes (MB) of data storage. A double-layered and double-sided DVDs hold up to 15.9 gigabytes (GB) of data.

This form of media is so named because its technology is based on light. As the disk spins, a laser beam follows a spiraling trail of pits and lands in the plastic material of the disk. The pits reflect light differently than the lands, while a device translates the reflective difference to bits of "on/off" or 1 and 0. The bits form bytes that carry the digital code of the data stored on the optical disk. A standard optical disk measures 4.724 inches (120 mm) in diameter and 0.0472 inches (1.2 mm) in thickness. It is made from polycarbonate with a reflective layer of aluminum, coated in lacquer. The master disk is made from glass.

There are three forms of optical disks available:

•CD-ROM: CD-ROM (compact disk read only memory) is an optical disk storage that contains text, graphics and hi-fi stereo sound. CD-ROM is available in different capacity. In CD- ROM standard, data (text or pictures) cannot be viewed with audio play simultaneously. CD-ROM X-A standard can do.



•WORM: A WORM (write once, read many) disk is an optical disk that written on just once by the user's environment and then cannot be overwritten. A WORM disk is ideal for use as archive because it can be read many times, but the data cannot be erased. The storage capacity of WORM disk ranges from 400 MB to 6.4 GB.

•Erasable Optical Disks: This is an optical disk that can be erased and written on repeatedly. An erasable optical disk has a great deal of data capacity. It can store up to 4.6 GB. An erasable optical disk functions like a magnetic disk and has huge capacity, so it will replace the magnetic disk in the future.

## **INPUT AND OUTPUT DEVICES:**

### 1) Keyboard:

It is the standard input device present in the computer. It is a text base input device that allows the user to input alphabets, numbers and other characters. It consists of a set of keys mounted on a board. They are:

Alphanumeric Keypad: It consists of keys for English alphabets, 0 to 9 numbers, and special characters like + -/\*() etc.

**Function Keys:** There are twelve function keys labeled F1, F2, F3... F12. The functions assigned to these keys are different from one software package to another. These keys are also user programmable keys.

**Special-function Keys:** These keys have special functions assigned to them and can be used only for those specific purposes. Functions of some of the important keys are defined below.

Enter: It is similar to the 'return' key of the typewriter and is used to execute a command or program.

Spacebar: It is used to enter a space at the current cursor location.

**Backspace:** This key is used to move the cursor one position to the left and also delete the character in that position.

**Delete:** It is used to delete the character at the cursor position.

Insert: Insert key is used to toggle between insert and overwrite mode during data entry.

**Shift:** This key is used to type capital letters when pressed along with an alphabet key. It is also used to type the special characters located on the upper-side of a key that has two characters defined on the same key.

**Caps Lock:** Cap Lock is used to toggle between the capital lock features. When 'on', it locks the alphanumeric keypad for capital letters input only.

**Tab:** Tab is used to move the cursor to the next tab position defined in the document. Also, it is used to insert indentation into a document.

Ctrl: Control key is used in conjunction with other keys to provide additional functionality on the keyboard.

Alt: Also like the control key, Alt key is always used in combination with other keys to perform specific tasks.

Esc: This key is usually used to negate a command. Also used to cancel or abort executing programs.

Numeric Keypad: Numeric keypad is located on the right side of the keyboard and consists of keys having numbers (0 to 9) and mathematical operators (+ - \* /) defined on them. This keypad is provided to support quick entry for numeric data.

**Cursor Movement Keys:** These are arrow keys and are used to move the cursor in the direction indicated by the arrow (up, down, left, right).

### 2) Mouse

The mouse is a small device used to point to a particular place on the screen and select in order to perform one or more actions. It can be used to select menu commands, size windows, start programs etc. The most basic or standard type of mouse has two buttons on top: the left one being used most frequently.

Mouse Actions

Left Click: Used to select an item.

**Double Click:** Used to start a program or open a file.

Right Click: Usually used to display a set of commands.

**Drag and Drop**: It allows you to select and move an item from one location to another. To perform this action place the cursor over an item on the screen, click the left mouse button and while holding the button down move the cursor to where you want to place the item, and then release it.

#### **Types of Mouse:**

**1). Mechanical:** This is a type of computer mouse that has a rubber or metal ball on its underside and it can roll in every direction. There are sensors within the mouse, which are mechanical, detect the direction in which the ball is moving and moves the pointer on the screen in the same direction. A mouse pad should be used under the mouse to run on.

2) **Opto-Mechanical:** This is the same as the mechanical mouse but it uses optical sensors to the motion of the ball. A mouse pad is used under the mouse to run on.

**3) Optical:** This type uses a laser for detecting the mouse's movement. It doesn't need a mouse pad but you can use one made for optical mice. Optical mice do not have any mechanical moving parts. The optical mouse responds more quickly and precisely than the mechanical and opto-mechanical mice.

Interface for mouse:

**Serial mouse:** these ones connect directly to an RS-232C serial port or a PS/2port. This is the simplest type of connection.

**PS/2 mouse:** connects to a PS/2 port.

**USB mice:** Uses USB interface for connecting the mouse to the PC.

**Cordless mouse:** These are not physically connected to the computer. They work on infrared or radio waves to communicate with the computer. Cordless are more expensive than both the serial and bus mouse.

## 3) Joystick:

The joystick is a vertical stick which moves the graphic cursor in a direction the stick is moved. It typically has a button on top that is used to select the option pointed by the cursor. Joystick is used as an input device primarily used with video games, training simulators and controlling robots.

### 4) Scanner

Scanner is an input device used for direct data entry from the source document into the computer system. It converts the document image into digital form so that it can be fed into the computer. Capturing information like this reduces the possibility of errors during large data entry. It captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. Scanners come in hand-held, feed-in( sheet-fed), and flatbed types and for scanning black-and-white only, or color. Very high resolution scanners are used for scanning for high-resolution printing, but lower resolution scanners are adequate for capturing images for computer display. Scanners usually come with software, such as Adobe's Photoshop product, that lets you resize and otherwise modify a captured image. Hand-held scanners are commonly seen in big stores to scan codes and price information for each of the items. They are also termed the bar code readers. As the scanner is a peripheral for scanning documents i.e. converting a paper document to a digital image? There are generally three types of scanner:

- Flat scanners let you scan a document by placing it flat against a glass panel. This is the most common type of scanner.
- Hand scanners are smaller in size. These scanners must be moved manually (or semi-manually) in successive sections over the document in order to scan the whole document.
- Sheet-fed scanners feed the document through a lighted slot in order to scan them, similar to fax machines. This type of scanner is increasingly built into machines such as multi-function printers.

## 5) Bar codes

A bar code is a set of lines of different thicknesses that represent a number. Bar Code Readers are used to input data from bar codes. Most products in shops have bar codes on them. Bar code readers work by shining a beam of light on the lines that make up the bar code and detecting the amount of light that is reflected back.

6) Light Pen: It is a pen shaped device used to select objects on a display screen. It is mostly like the

mouse in its function but uses a light pen to move the pointer and select any object on the screen by pointing to the object. Users of Computer Aided Design (CAD) applications commonly use the light pens to directly draw on screen.

7) **Touch Screen:** A touch screen is a computer display screen that is also an input device. The screens are sensitive to pressure; a user interacts with the computer by touching pictures or words on the screen. It allows the user to operate/make selections by simply touching the display screen. Common examples of touch screen include information kiosks, and bank ATMs.

8) Digital camera: A digital camera can store many more pictures than an ordinary camera. Pictures taken using a digital camera are stored inside its memory and can be transferred to a computer by connecting the camera to it. A digital camera takes pictures by converting the light passing through the lens at the front into a digital image.

**9)** Speech Input Device (Voice Recorder): The "Microphones - Speech Recognition" is a speech Input device. To operate it we require using a microphone to talk to the computer. Also we need a sound card to the computer. The Sound card digitizes audio input into 0/1s .A speech recognition program can process the input and convert it into machine-recognized commands or input.

## **Output Devices:**

1) Graphics Display Device:

## a) Monitor(CRT):

Monitor is an output device that is same as the television screen and uses a Cathode Ray Tube (CRT) to display information. The monitor works in combination with a keyboard for manual input of characters and displays the information as it is typed in. It also displays the program or application output. Like the television, monitors are also available in different sizes.

### (b) Liquid Crystal Display (LCD):

LCD was introduced in the 1970s and is now applied to display terminals also. It has advantage like low energy consumption, smaller and lighter in size so has much usage in portable computers (laptops).

### 2) Printer

Printers are used to produce paper known as hardcopy output. According to the technology used, they can be classified as Impact or Non-impact printers.

**a)Impact printers** use the typewriting printing mechanism where a print-head strikes with force on the paper through a ribbon to produce output. Dot-matrix and Character printers are type of Impact Printer.

Dot matrix printers, known also as impact printers, represent the oldest printing technology, are still the used today. Dot matrix printers are divided on two main groups: serial dot matrix printers and line printers (or line dot matrix printers). Line printers as well as serial dot matrix printers use pins to strike against the inked ribbon, making dots on the paper and forming the needed characters. The differences are that line printers use hammer bank (or print-shuttle) instead of print head, this print-shuttle has hammers instead of print wires, and these hammers are arranged in a horizontal row instead in vertical column. The hammer bank uses the same technology as the permanent magnet print head with the small difference that instead of print wires the print-shuttle has hammers.

The printing mechanism is that the permanent magnetic field holds the hammer spring in stressed, ready to strike position. The driver sends electrical current to hammer coil, which then creates electromagnetic field opposite to the permanent magnetic field. When both fields equalize, the energy stored in the spring is released to strike the hammer against the ribbon and prints a dot on the paper.

During printing process the print-shuttle vibrates in horizontal direction with high speed while the print hammers are fired selectively. So each hammer may print a series of dots in horizontal direction for one pass of the shuttle, then paper advances at one step and the shuttle prints the following row of dots. Line matrix printers are the right solutions for high-volume impact printing and are superior in speed, reliability and quality. As price-performance leaders, line printers cost less to service and less to use.

**b**) **Non-impact printers** do not touch the paper while printing. They use chemical, heat or electrical signals to create the symbols on paper. Inkjet, DeskJet, Laser printers are the type of Non-Impact Printer.

The two basic qualities associated with printers are resolution, and speed. Print resolution is measured in terms of number of dots per inch (dpi). Print speed is measured in terms of number of characters printed in a unit of time and is represented as characters-per-second (cps), lines-per-minute (lpm), or pages-per-minute (ppm).

c) Serial Printer: A computer printer that attaches to the computer through a serial interface. Because of slow transmission times and compatibility issues, today the serial printer is not commonly used and is being replaced by the parallel printer.

d) Letter- Quality Printer: The letter quality is the quality of the printed output of a printer equal to or better than what a standard electronic typewriter is capable of producing. Laser and ink printers are capable of printing letter-quality type.

e) Laser Printer: Laser Printer working principle depends on dry powder technology. It uses hot pressure rollers to melt and fuse the toner materials to print on the plain paper.

Laser Printer is widely used in offices, homes and cyber cafe, because of its ability to print on plain paper and the images are permanent.

Laser printer most probably connected to single computer or to LAN to serve a single or many users. So, multiple users can print documents from their machine.

Laser Printer-Components: Main components in the printer are Toner cartridge, charge and discharge (corona) wires, transfer rollers, fusing unit, paper pick-up assembly, transport section and exit section with "decurl" rollers and electro static discharge.

# Laser Printer Working Principle:

**Receiving Data:** The Laser printer has to receive the data (text or picture) from the source. This job is done by the printer controller. The printer controller is the laser printer's main on board computer. It communicates with the host computer through parallel port or USB port or through LAN. Once the data is received and buffered the

printing process starts. Printing speed and data receiving speed are different, therefore laser printer stores received data before printing.

**Charging drum:** Toner cartridge consists of aluminum cylinder coated with photosensitive material, fresh toner tank and waste toner collection tank. Once the data is received, drum is charged with high negative voltage through the charge carona wire placed at the top of the drum in toner cartridge.

**Exposing drum:** The received data is fed to the laser diodes or LED's to illuminate. These light rays which is same as the received character, is written on the charged drum, which neutralize the negative charge in the drum surface. Exposed areas or neutralized area mostly invisible to human eyes which is exactly same as original received data. Simultaneously toner in the toner cartridge is charges negatively.

When the drum rotates and come closer to the toner container, exposed areas attracts the negatively charges toner particles thereby forming visible image in the drum surface.

**Paper feed:** Once the drum is ready with printable data, paper is picked up by the pick-up roller assembly. Toner cartridge is placed in the printer in such a way that the drum unit in the cartridge is in very near to transfer roller in the printer base. Transfer roller is charged highly, then paper is fed in between transfer roller and drum unit. Transfer roller charge pulls the toner particle in the drum unit which sticks to the paper there by image is transferred to the paper.

This image is not permanent and it can be erased by rubbing. After transferring the data to paper any remaining waste toners are cleaned by blade and collected in the waste toner container.

**Fusing:** Since the image or data in the paper is erasable, paper is fed in to fusing unit. Fusing unit or fuser unit has two rollers, Heat roller attains maximum temperature using halogen lamp and another roller applies pressure when the paper is fed in between them. Due to high temperature in the heat roller toner and glue particles in the paper melts and sticks to the paper and the image becomes permanent.

**Discharge:** To print the next received data, drum must be cleaned to remove any traces of previous pages. Rubber blade wipes the excess toner from the drum, and then discharge lamp is used to expose and clean the drum by neutralizing residual electrical charges on it. At the paper exit a grounded discharge material touches the paper to remove electro static charges. Paper bends because of the heat applied by the fuser unit, de-curl rollers are used to straighten the paper while exit.

Some of the problems you may face in laser printer is when the charge carona wire, transfer roller, discharge wire are not functioning properly or dust accumulated, it affect the printout with vertical black lines, black background with actual data.

#### f) Plotter:

Plotters are used to print graphical output on paper. It interprets computer commands and makes line drawings on paper using multicolored automated pens. It is capable of producing graphs, drawings, charts, maps etc. Computer Aided Engineering (CAE) applications like CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) are typical usage areas for plotters.

#### S/W:

### **OVERVIEW OF SOFTWARE:**

S/W, software is a collection of instructions that enable the user to interact with a computer or have it perform specific tasks for them. Without software, computers would be useless. For example, without your Internet browser software you would be unable to surf the Internet or read this page and without a software operating system the browser would not be able to run on your computer. In the pictures are a Microsoft Excel software box and an example of a software program.

#### SYSTEM AND APPLICATION S/W:

Software can be broadly classified in two categories:

- 1. System Software, and
- 2. Application Software.

## 1. System Software:

System software provides basic functionality to the computer. System software is required for the working of computer. The system software also consists of device drivers for the proper functioning of the hardware. When you request for using any of the devices, the device driver software interacts with the hardware device to perform the specified request.

System software provides basic functionality to the computer, controls computer hardware, and acts as an interface between user and computer hardware. System software may be used for the management of the computer, and, for the development of application software.

Operating System (OS) intermediates between user of computer and computer hardware. It manages resources of the computer system, controls execution of programs, and provides a convenient interface to the user for use of the computer. Ex: MS-DOS, Windows XP, Windows 7, UNIX and Mac OS. Device driver is the intermediate between the device and the software that uses the device. Each device has its own device driver, which must be installed on the computer for the proper working of the device. Device drivers can be character or block device drivers. For plug and play devices, the device drivers come preloaded with the operating system. System utility software is required for maintenance of the computer. Anti-virus, data compression, disk partitioning, backup, system profiling are some system utilities.

Programming languages include a set of commands that the user uses to write a program. Machine language is defined by the hardware of the computer. A program written in machine language is very fast, machine-dependent, and is difficult to write. Assembly language uses symbolic representation of machine code. An assembly language program is easier to write than the machine language program but is still machine dependent. A program written in a high-level language is English-like. High-level language programs are easier to write and are easily portable from one computer to another. The programming languages are classified into five generation of languages. Translator software is used to convert a program written in high-level language and assembly language to a form that the computer can understand. Assembler, compiler, and interpreter are the three kinds of translator software. Assembler converts a program written in assembly language into machine code. Compiler translates the program written in a high-level language to machine language program is the source code, and compiled program is the object code. Interpreter converts the high-level language program into machine code, but performs line-by-line execution of the source code, during the program execution.

Linker links several object modules and libraries to a single executable program. Loader loads and re-locates the executable program in the main memory.

## 2. Application Software:

The software that a user uses for performing a specific task is the application software. Application software may be a single program or a set of programs. A set of programs that are written for a specific purpose and provide the required functionality is called software package. Application software is written for different kinds of applications—graphics, word processors, media players, database applications, telecommunication, accounting purposes etc.

## **PROGRAMMING LANGUAGE:**

A programming language is a special language programmers use to develop applications, scripts, or other set of instructions for computers to execute. **"OR"** 

A programming language is a formal constructed language designed to communicate instructions to a machine, particularly a computer. Programming languages can be used to create programs to control the behavior of a machine or to express algorithms.

Different languages have different purposes. Some types are:

- Machine languages interpreted directly in hardware
- Assembly languages thin wrappers over a corresponding machine language
- High-level languages anything machine-independent
- System languages designed for writing low-level tasks, like memory and process management

## 1. Machine level language:

Most computers work by executing stored programs in a fetch-execute cycle. Machine code generally features

- a) Registers to store values and intermediate results
- b) Very low-level machine instructions (add, sub, div, sqrt)
- c) Labels and conditional jumps to express control flow
- d) A lack of memory management support programmers do that themselves

Machine code is usually written in hex.

Example: for the Intel 64 architecture:

89 F8 A9 01 00 00 00 75 06 6B C0

03 FF C0 C3 C1 E0 02 83 E8 03 C3

## 2. Assembly language:

An assembly language is basically just a simplistic encoding of machine code into something more readable. It does add labeled storage locations and jump targets and subroutine starting addresses, but not much more.

The function on the Intel 64 architecture using the GAS assembly language:

```
.globl f
```

.text

```
f:
```

1.			
r	mov	%edi, %eax	# Put first parameter into eax register
t	test	\$1, %eax	# Isloate least significant bit
j	jnz	odd	# If it's not a zero, jump to odd
i	imul	\$3, %eax	# It's even, so multiply it by 3
i	inc	%eax	# and add 4
r	ret		# and return it
even:			
S	shl	\$2, %eax	# It's odd, so multiply by 4
S	sub	\$3, %eax	# and subtract 3
ľ	ret		# and return it

## 3. High level language:

A high-level language gets away from all the constraints of a particular machine. HLLs have features such as:

- Names for almost everything: variables, types, subroutines, constants, modules
- Complex expressions (e.g.  $2 * (y^5) \ge 88 \&\& sqrt(4.8) / 2 \% 3 == 9$ )
- Control structures (conditionals, switches, loops)
- Composite types (arrays, structs)
- Type declarations

- Type checking
- Easy ways to manage global, local and heap storage
- Subroutines with their own private scope
- Abstract data types, modules, packages, classes
- Exceptions Example: C & C++ Code

```
int f(const int n) {
    return (n % 2 == 0) ? 3 * n + 1 : 4 * n - 3;
}
```

## 4. System Language:

System programming languages differ from application programming languages in that they are more concerned with managing a computer system rather than solving general problems in health care, game playing, or finance. System languages deal with:

- Memory management
- Process management
- Data transfer
- Caches
- Device drivers
- Operating systems

## S/W ISSUES AND TRENDS:

Since software is an important part of computer systems issues such as software bugs, licensing, upgrades and global support have received increased attention.

## Software Bugs:

A software bug is a defect in a computer program that keeps it from performing in the matter intended. Some bugs are subtler and can go unnoticed until it is to late. An example is the denial of service attack on Yahoo! in 1999.

## **Open Source Software:**

Open source software is software that freely available to anyone in a form that can be easily modified. The example is My SQL and PHP. A number of open source programs are available including Linux and Apache. advantage

- Costomisability
  - Everybody has the right to modify the source code, This means the code can be implemented in order pieces of software and adapted to changing environment
- Quality
  - In general, open source software gets closest to what user want because those users can have a hand in making. Users and developers make what they want and they make high quality of source.
- Cost
  - Most current Open Source are available free of royalities
  - Individuals and smaller companies may aid in developing the software reducing number of programmers to pay the salaries.

### **Disadvantage:**

- No guarantee
  - It is impossible to know if a project will ever reach a suitable stage on time and even if it reaches, it may have many bugs or problems later and no one guarantees the software and nobody is bound to give you regular updates since it is free.
- No support
  - Since it is free, there is no support even thought there are many helps available on the internet, the users have to have self-motivation to help them install and to run open software without any support.
- Not reliable
  - Because the users can modify the source by themselves, the source could have some problems and may not be reliable.

### **Software Licensing:**

In general, software manufacturers want to license their software to lock in steady, predictable stream of revenue from customers. Client should be aware of EULA:

## **EULA (End User License Agreement):**

The type of license used for most software. An EULA is a legal contract between the manufacturer and/or the author and the end user of an application. The EULA details how the software can and cannot be used and any restrictions that the manufacturer imposes. The contract between the licensor and purchaser, establishing the purchaser's right to use the software. Software Upgrades Software companies revise their programs and sell new versions periodically. In some cases the revised software offers new and valuable enhances. Example of upgrades includes service packs provide by Microsoft for their operating systems.

### **Global Software Support:**

Globalization has ensured that computer networks stretch to all corners of the earth. Software producers need to ensure they provide global support otherwise people will go to their competition instead.

### **Block Diagram of Computer:**

A computer can process data, pictures, sound and graphics. They can solve highly complicated problems very fast and accurately.



### **Input Unit:**

Computers need to receive data and instruction in order to solve any problem. So, we need to input the data and instructions into the computers. The input unit consists of one or more input devices. Keyboard is the one of the most commonly used input device. Other commonly used input devices are the mouse, scanner, microphones etc. All the input devices perform the following functions.

- Accept the data and instructions from the outside world.
- Convert it to a form that the computer can understand.
- Supply the converted data to the computer system for further processing.

## Storage Unit:

The storage unit of the computer holds data and instructions that are entered through the input unit, before they are processed. It preserves or stores the intermediate and final results before these are sent to the output devices. It also saves the data for the later use. The various storage devices of a computer system are divided into two categories.

**1. Primary Storage:** It Stores and provides stored data very fast. This memory is generally used to hold the program being currently executed in the computer, the data being received from the input unit, the intermediate and final results of the program. The primary memory is temporary memory. The data is lost, when the computer is switched off. So, to store the data permanently, the data has to be transferred to the secondary memory. The cost of the primary storage is more compared to the secondary storage. Therefore most computers have limited primary storage capacity.

**2. Secondary Storage:** Secondary storage is used like an archive (storing or saving for longer time). It stores several programs, documents, databases etc. The programs that you run on the computer are first transferred to the primary memory before it is actually run. Whenever the results are saved, again they get stored in the secondary memory. The secondary memory is slower and cheaper than the primary memory. Some of the commonly used secondary memory devices are Hard disk, CD, etc.

## Memory Size:

All digital computers use the binary system, i.e. 0's and 1's. Each character or a number is represented by an 8 bit code. The set of 8 bits is called a byte. A character occupies 1 byte space. A numeric occupies 2 byte space. Byte is the space occupied in the memory. The size of the primary storage is specified in KB (Kilobytes) or MB (Megabyte). One KB is equal to 1024 bytes and one MB is equal to 1000KB. The size of the primary storage in a typical PC usually starts at 16MB. PCs having 32 MB, 48MB, 128 MB, 256MB, 512 MB, 1 GB, 2 GB, 3 GB memory are quite common.

# Output Unit:

The output unit of a computer provides the information and results of a computation to outside world. Printers, Visual Display Unit (VDU) are the commonly used output devices. Other commonly used output devices are printers, speakers etc.

### Arithmetic Logical Unit (ALU):

All calculations are performed in the Arithmetic Logic Unit (ALU) of the computer. It also does comparison and takes decision. The ALU can perform basic operations such as addition, subtraction, multiplication, division, etc and does logic operations like >, <, = AND, OR, Complements, XOR etc. Whenever calculations are required, the control unit transfers the data from storage unit to ALU & once the computations are done, the results are transferred to the storage unit by the control unit and then it is send to the output unit for displaying results.

## **Control Unit:**

It controls all other units in the computer. The control unit instructs the input unit, where to store the data after receiving it from the user. It controls the flow of data and instructions from the storage unit to ALU. It also controls the flow of results from the ALU to the storage unit. The control unit is generally referred as the central nervous system of the computer that control and synchronizes its working.

## **Central Processing Unit (CPU):**

The control unit and ALU of the computer are together known as the Central Processing Unit (CPU). The CPU is like brain performs the following functions:

- It performs all calculations.
- It takes all decisions.
- It controls all units of the computer.

A PC may have CPU-IC such as Intel 8088, 80286, 80386, 80486, Celeron, Pentium, Pentium Pro, Pentium II, Pentium III, Pentium IV, Dual Core, Core 2 Duo, Core i Series and AMD etc.