Chapter1: Principles of Information Systems

Al-Qadissiyah University, College of Computer Science & IT,

Department of CIS - 1st Stage

➤ **System Definition:** interrelated components functioning together to achieve an outcome, or It is a group of elements and components that are related and interact with each other and that work together Within specific environmental conditions to achieve a specific goal

➤ **System components are:**
- The group of objects (elements) to form the system.
- A set of logical and physical relationships between the components of the system.
- Its system working environment.

➤ **Then System components represents**
- **Input:** Activity of gathering and capturing raw data**.**
- **Processing:** Converting data into useful outputs.
- **Output:** Production of useful information, usually in the form of documents and reports.
  - ➤ **Feedback:** Information from the system that is used to make changes to input or processing activities
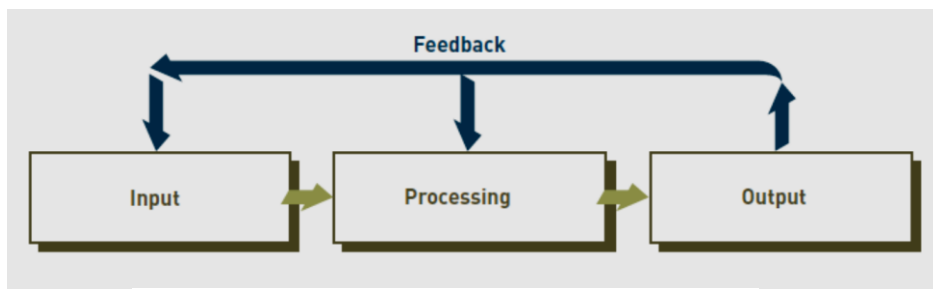
Fig(1): Basic System components

➤ **Information System:** is a set of interrelated components work together to collect, retrieve, process, store and disseminate information for the purpose of facilitating planning, control, analysis ,coordination and decision making in business and other organizations.
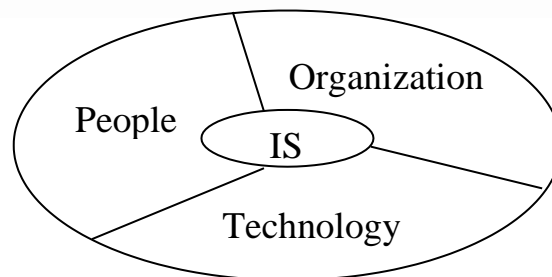

Fig(2): Information System Components

- **Data:** Raw facts
- **Information:** Collection of facts organized in such a way that they have value beyond the facts themselves.
- **Knowledge:** Awareness and understanding of a set of information.

| Data	Represented by
Alphanumeric data	Numbers, letters, and other characters
Image data	Graphic images and pictures
Audio data	Sound, noise, or tones
Video data	Moving images or pictures

Fig(3): Types of Data
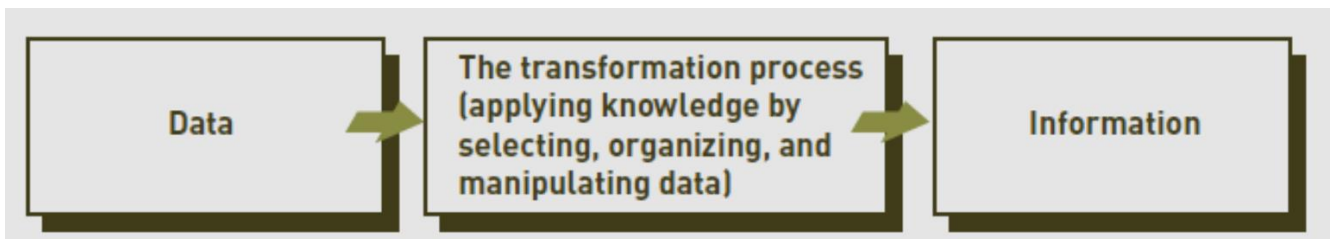
Fig(4): The Process of Transforming Data into Information

- **Overview of information systems:** There are many types of information systems in the real world. All of them use hardware, software, network, and people resources to transform data resource into information products. Some are

  - **Manual Information Systems**, where people use simple tools such as pencils and paper, or even machines such as calculators and typewriters.

  - **Computer-Based Information Systems,** that rely on a variety of computer systems to accomplish their information processing activities.

The Computer-Based Information Systems are:

- Single set of Hardware, Software, Databases, Telecommunications, People, and procedures:
    - That are configured to collect, manipulate, store, and process data into information.

➤ Technology infrastructure:
  - Includes all hardware, software, databases, telecommunications, people, and procedures.
  - Configured to collect, manipulate, store, and process data into information.
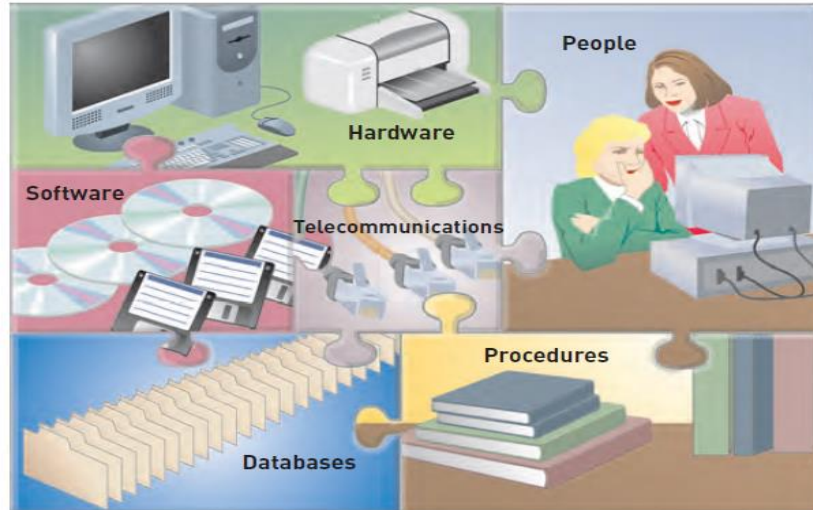
Fig(5): The Components of Computer-Based Information Systems

➤ **Hardware:**
  - Consists of computer equipment used to perform input, processing, and output activities.
➤ **Software:**
  - Consists of the computer programs that govern the operation of the computer.
➤ **Database:**
  - Organized collection of facts and information, typically consisting of two or more related data files.
➤ **Telecommunications, networks, and the Internet:**
  - The electronic transmission of signals for communications.
➤ **Networks:**
  - Connect computers and equipment to enable electronic communication.
➤ **Internet:**
  - World's largest computer network, consisting of thousands of interconnected networks, all freely exchanging information.
➤ **Intranet:**
  - Internal network that allows people within an organization to exchange information and work on projects.

➢ **Extranet:**
  - Network that allows selected outsiders, such as business partners and customers, to access authorized resources of a company's intranet.
➢ **People:**
  - The most important element in most computer-based information systems.
➢ **Procedures:**
  - Include strategies, policies, methods, and rules for using the CBIS.

Chapter2: Principles of Information Systems

Al-Qadissiyah University, College of Computer Science & IT,

Department of CIS - 1st Stage

➢ **Information System (IS) versus Information Technology (IT):**

  ▪ IS is all the components and resources necessary to deliver information and functions to the organization.

  ▪ IT is hardware, software, networking and data management.

  ▪ IS Knowledge Framework for Business Professionals.
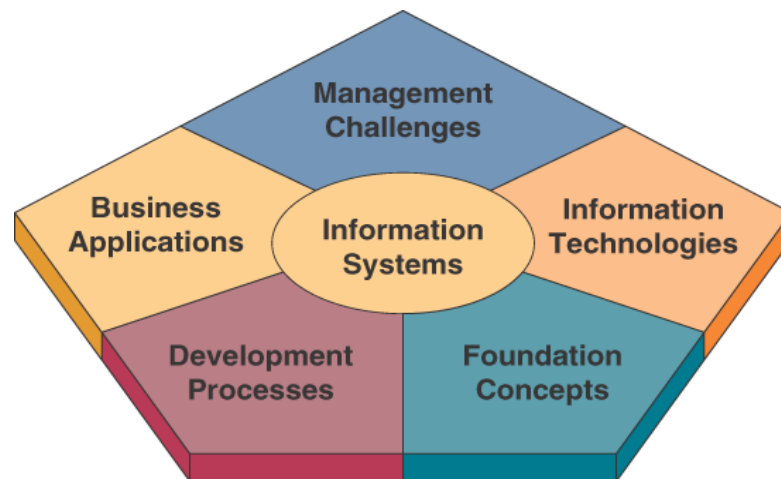
Fig(6)- IS framework for Businesses

➢ **The components of framework IS for Businesses are:**

  ▪ Foundation Concepts: fundamental behavioral, technical, business and managerial concepts.

  ▪ Information Technology: Hardware, software, networks, data management and Internet-based technology.

  ▪ Business Applications: Major uses of the IS in the organization.

  ▪ Development Processes: How to plan, develop and implement IS to meet business opportunities.

  ▪ Management Challenges: The challenges of effectively and ethically managing IT.

➢ **Fundamental Roles of IS in Business:**

  ▪ Support of business processes and operations.

  ▪ Support of decision making by employees and managers.

  ▪ Support of strategies for competitive advantage.

- ➢ **The E-business explain:**
  - ▪ The use of Internet technologies
    - • To work and empower business processes, electronic commerce, and enterprise collaboration.
    - • Within a company and with its customers, suppliers, and other business stakeholders.
  - ▪ An online exchange of value.
- ➢ **The E-business use:**
  - ▪ Reengineer internal business processes.
  - ▪ Enterprise collaboration systems: support communications, coordination and collaboration among teams and work groups, e.g., virtual teams.
  - ▪ Electronic commerce: buying, selling, marketing and servicing of products and services over computer networks.

- ➢ **Types of information systems:**

  Conceptually, information systems in the real world can be classified several different ways. For example, several types of information systems can be classified as either **Operations** or **Management Information Systems**. Figure(7) bellow illustrates this conceptual classification of information systems.
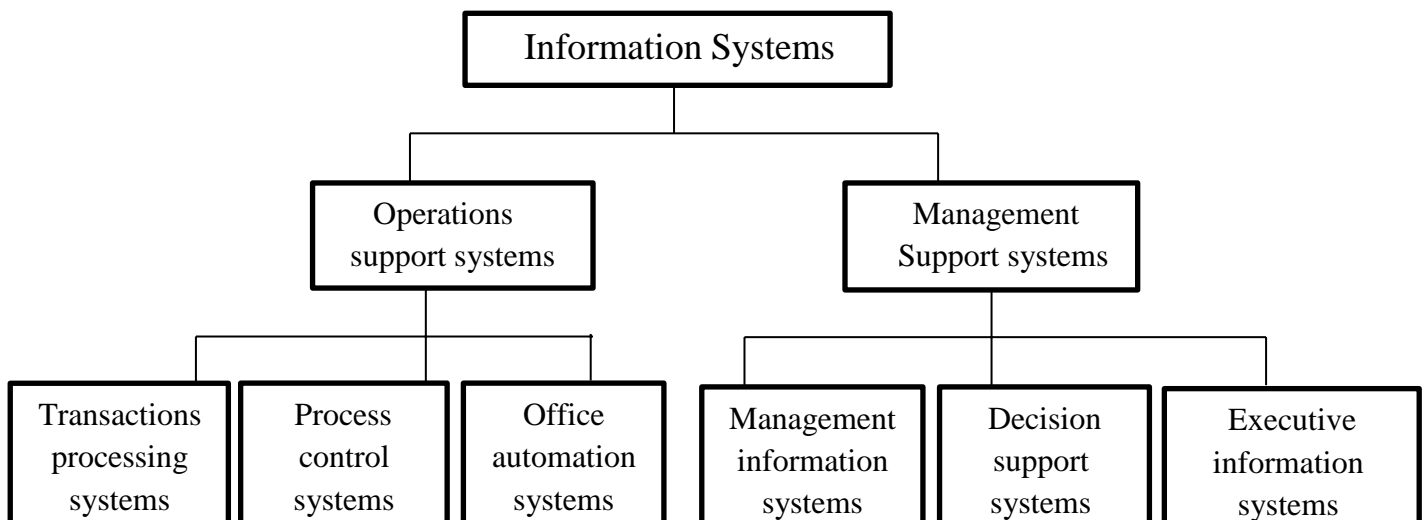
Figure(7)- Operation and management classification of Information systems

1. Operations support systems:

Information systems have always been needed to process data generated by and used in business operations. Such operations support systems produce a variety of information product for internal and external use. However they do not emphasize producing the specific information product that can best used by manager. Further processing by management information systems is usually required. The role of a business firm's operations support systems is to efficiently process business transactions, control industrial process, support office communications and productivity, and update corporate databases.

(a) **Transactions processing systems** are an important example of operations support systems that record and process data resulting from business transactions. They process transactions in two ways:-

- **Batchprocessing**, transactions data is accumulated over a period of time and processed periodically.
- **Real-time (or online)** processing, data is processed immediately after a transaction occurs.

(b) **Process Control Systems** monitor and control physical process. For example, a petroleum refinery uses electronic sensors linked to computers to continually monitor chemical processes and make instant (real-time) adjustments that control the refinery process.

(c) **Office Automation Systems** enhance office communications and productivity. For example, a corporation may use word processing for office correspondence, and electronic mail to send and receive electronic messages.

2. Management support systems:

When information systems focus on providing information and support for effective decision making by managers, they called management support systems .Providing information and support for decision making by all levels of management (from top

executives to middle manager to supervisors) is a complex task. Conceptually, several major types of information systems support a variety of managerial end user responsibilities:-

(a) **Management information systems** provide information in the form of reports and displays to manager. For example, sales managers may use their computer workstations to get instantaneous displays about the sales results of their products and to access weekly sales analysis reports that evaluate sales made by each salesperson.

(b) **Decision support systems** give direct computer support to managers during the decision-making process.

(c) **Executive information systems** provide critical information in easy to use displays to top and middle management. For example, top executives may use touch screen terminals to instantly view text and graphicsdisplays that highlight key areas of organizational and competitive performance.

Chapter3: Principles of Information Systems

Al-Qadissiyah University, College of Computer Science & IT,

Department of CIS - 1st Stage

➢ **Business Information Systems**: Most common types of information systems, those designed for electronic and mobile commerce, transaction processing, management information, and decision support.
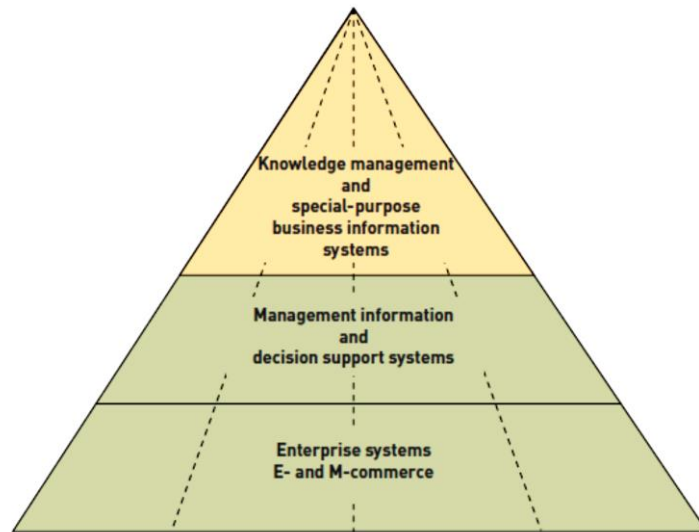
Figure(8)- Business Information System are often integrated in one product and can be delivered by the same software
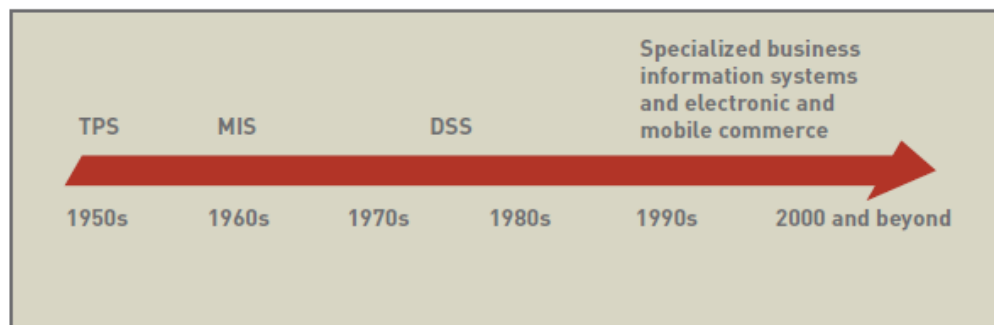
Figure(9)- The Development of Business Information System

➢ **Electronic and Mobile Commerce**:

  ▪ **E-commerce**: Can enhance a company's stock prices and market value, any business transaction executed electronically between:

   • Companies (business-to-business, B2B).
   • Companies and consumers (business-to-consumer, B2C)
   • Consumers and other consumers (consumer-to-consumer, C2C)
   • Business and the public sector
   • Consumers and the public sector

- **Mobile commerce (m-commerce)**: The use of mobile, wireless devices to place orders and conduct business.
- **Electronic business (e-business)**: Uses information systems and the Internet to perform all business related tasks and functions.
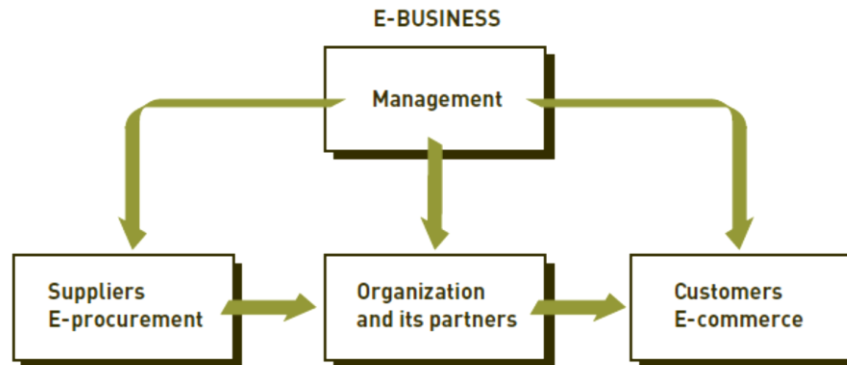
Figure(10)- Electronic Business

- **Enterprise Systems**: Transaction Processing Systems and Enterprise Resource Planning:
    - **Transaction**: Any business-related exchange, such as payments to employees and sales to customers.
    - **Transaction processing system (TPS)**: Organized collection of people, procedures, software, databases, and devices used to record completed business transactions.
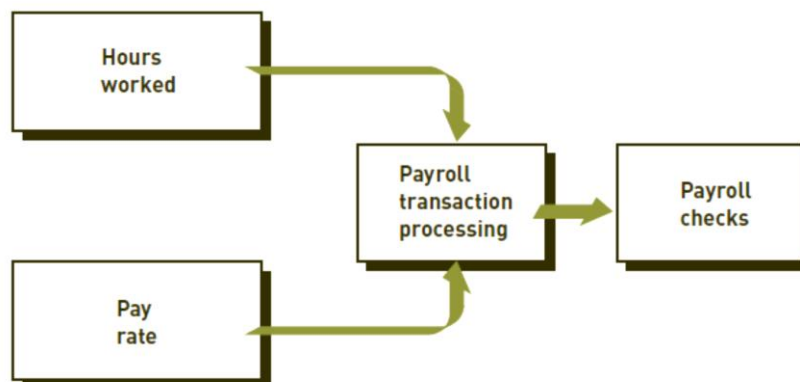
Figure(11)- A Payroll Transaction processing system

- **Enterprise resource planning**: Set of integrated programs that manages the vital business operations for an entire multisite, global organization.

- **Information and Decision Support Systems**: Organized collection of people, procedures, software, databases, and devices that provides routine information to managers and decision makers.
  - **Decision Support System (DSS)**: Organized collection of people, procedures, software, databases, and devices that support problem-specific decision making.
- **Specialized Business Information Systems:** Knowledge Management, Artificial Intelligence, Expert Systems, and Virtual Reality:
  - **Knowledge Management Systems (KMSs)**: Organized collection of people, procedures, software, databases, and devices to Create, store, share, and use the organization's knowledge and experience**.**
  - **Artificial intelligence (AI)**: Computer system takes on characteristics of human intelligence**.**
- **Specialized Business Information Systems**:
  - **Expert systems**: Give computer ability to make suggestions and function like an expert in a particular field**.**
  - **Virtual Reality and Multimedia**: Virtual reality is a Simulation of a real or imagined environment that can be experienced visually in three dimensions**,** Multimedia it can include photos and images, the manipulation of sound, and special 3D effects.

- **Information System Resources:**

  Our basic IS model shows that an information system consists of five major resources:

  - **People Resources**: People are required for the operation of all information systems. These people resources include:
    - **End users** (also called users or clients) are people who use an information system or the information it produces. They can be sales persons, engineers or managers.

- **IS specialists** are people who develop and operate information systems. They include systems analysts, or programmers.
- **Hardware Resources**: The concept of hardware resources includes all physical devices and materials used in information processing examples of hardware resources in computer based information system are
  - **Computer systems**, which consists of central processing units (CPUs) and a variety of interconnected peripheral devices. Examples are large mainframe computer systems and microcomputer systems.
  - **Computer peripherals**, which are devices such as a keyboard or electronic mouse for input of data and commands, a video screen or printer for output of information, and magnetic or optical disks for storage of data resource.
- **Software Resources**: The concept of software resources includes all sets of information processing instructions. The following are examples of software resources:
  - **System software**, such as an operating system program , which controls and supports the operations of a computer system.
  - **Application software**, which are programs that direct processing for a particular use of computers by end users. Example is a word processing program.
  - **Procedures**, which are operating instructions for the people who will use an information system. Example is using a software package.
- **Data Resources:** The concept of data resources has been broadened by managers and information systems professionals. They realize that data constitutes a valuable organizational resource. Thus, you should view data resources that must be managed effectively to benefit all end users in an organization. The data resources of information systems are typically organized into:

- **Databases** that hold processed and organized data.
- **Knowledge bases** that hold knowledge in a variety of forms such as facts and rules of inference about various subjects.

- **Network Resources**: Telecommunication network have become essential to the successful operations of modern organizations and their computer based information systems. Telecommunication network consists of computers, end user terminals, communications processors and other devices interconnected by communications media and controlled by communications software.Net work resources include:
  - **Communication media**: examples include twisted-pair wire, coaxial cable, fiber optic cable, microwave systems, and communications satellite systems.
  - **Network support**: this generic category includes all of the people, hardware, software, and data resources that directly support the operation and use of a communication network.

- **Information System Software**: System software consists of programs that manage and support a computer system and its information processing activities. These programs serve as a vital software interface between computer system hardware and the application programs of end users. See figure bellow. We can group such programs into three major functional categories:
  - **System Management Programs**: Programs that manage the hardware, software, and data resources of the computer system during its execution of the various information process jobs of users. The most important system management programs are operating systems and operating environments.
  - **System Support Programs**: Programs that support the operation and management of a computer system by providing a variety of support services. Major support programs are system utilities, performance monitors, and security monitors.

- **System Development Programs**: Programs that help users develop information system programs and procedures and prepare user programs for computer processing .major development programs are language translators and programming tools.
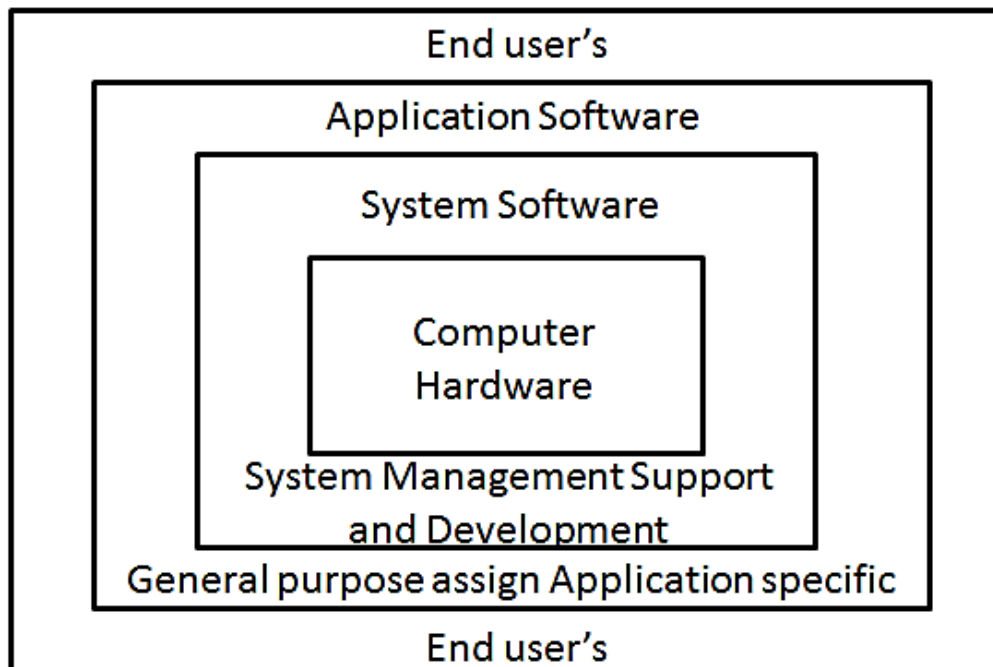
Figure(12)- The System and Software Application interface between (End user's and Computer Hardware)

- ➢ **Operating System**: The most important system software packages for any computer its operating system. An operating system is an integrated system of programs that manages the operational of the CPU, control the input/output and storage resources and activities of the computer system, and provides various support services as the computer executes the application programs of users.

  - **Operating System functions**: An operating system performs five basic functions in the operation of a computer system as**:**
    - **User Interface**: The user interface is the part of the operating system that allows you to communicate with it so you can load programs, access files, and accomplish other tasks. The trend is toward in easy to use graphical user interface (GUI) that uses icons, bars, buttons, boxes, and other images .GUI rely on pointing devices like the electronic mouse to make selections that help you get things done.

- **Resource Management**: An operating system uses a variety of resources management programs to manage the hardware resources of a computer system, including its CPU, memory, secondary storage devices, and input/output peripherals. For example, memory management programs keep track of where data and programs are stored. They may also subdivide memory in to a number of sections and swap parts of programs and data between memory and magnetic disks or other secondary storage devices.
- **File management**: An operating system contains file management programs that control the creation, deletion, and access of files of data and programs. File management also involves keeping track of the physical location of files on magnetic disks and other secondary storage devices.
- **Task management**: The task management programs of an operating system manage the accomplishment of the computing tasks of end users. They give each task a slice of a CPU's time and interrupt the CPU operation to substitute other tasks.
- **System Support Programs**: System support programs are a category of software that performs routine support functions for the users of a computer system. Utility programs, or utilities, are an important example .The programs perform miscellaneous housekeeping and file conversion functions .For example, sort programs are important utility programs that perform the sorting operations on data required in many information processing applications. Utility programs also clear primary storage , load programs, record the contents of primary storage, and convert files of data from one storage medium to another.

  Other system support programs include performance monitor and security monitors. Security monitors are packages that monitor and control the use of computer systems and provide warning messages and record evidence of unauthorized use of computer resources.

➢ **Applications Software**: Application software consists of programs that direct computers to perform specific information processing activities for end users. These programs are called application packages because they direct the processing required for a particular use, or application, that end users want accomplished. Application software can be classified as:

- **General Purpose Programs**: General purpose application programs are programs that perform common information processing jobs for end users and can divide into:
    - **Word processing packages or Personal Software**: Programs that computerize the creation, editing, and printing of documents (such as letters, and reports) by electronically processing text data (words, phrases, sentences, and paragraphs).
    - **Database Management Packages**: Such as access by Microsoft allow end users to setup databases of files and records on their personal computer systems and quickly store data and retrieve information.
    - **Graphics Packages**: Convert numeric data into graphics displays such as line charts and bar graph. Many other types of presentation graphics displays are possible .Draw and paint graphics packages support freehand drawing.
- **Application Specific Programs**: Thousands of application software package are available to support specific applications of end users. Major categories of such application specific programs are:
    - **Business Application Programs**: Programs that accomplish the information processing tasks of important business functions or industry requirements.
    - **Scientific Application Programs**: Programs that perform information processing tasks for the natural, physical, and behavioral sciences, and for mathematics, engineering, and all other areas involved in scientific research, scientific analysis, engineering design, and monitoring of experiments.
    - **Other Application Programs**: There are so many other application areas of computers that we lump them all into this category. Thus, we can talk of computer applications in education, music, art ,law, medicine, and AI (Artificial Intelligence).

Chapter4: Principles of Information Systems

Al-Qadissiyah University, College of Computer Science & IT,

Department of CIS - 1st Stage

Chapter4: Principles of Information Systems

Al-Qadissiyah University, College of Computer Science & IT,

Department of CIS - 1st Stage

- ➢ **Systems Development:**
  - ▪ The Need for Structured Systems Development: The process of designing, building, and maintaining information systems is often referred to as systems analysis and design. The individual who performs this task is referred to as a systems analyst.
- ➢ **Steps in the Systems Development Process:**
  - ▪ The products that a firm produces and sells follow a life cycle, so do organizational information systems. The term systems development life cycle (SDLC) is used to describe the life of an information system from conception to retirement. The SDLC has five primary phases:

    1. System identification, selection, and planning (Investigation)

    2. System analysis

    3. System design

    4. System implementation

    5. System maintenance

In fig(13) below is a graphical representation of the SDLC. The SDLC is represented as boxes connected by arrows. Within the SDLC, arrows flow from the (System Identification, Selection, and Planning (Investigation)) to the (System Maintenance).
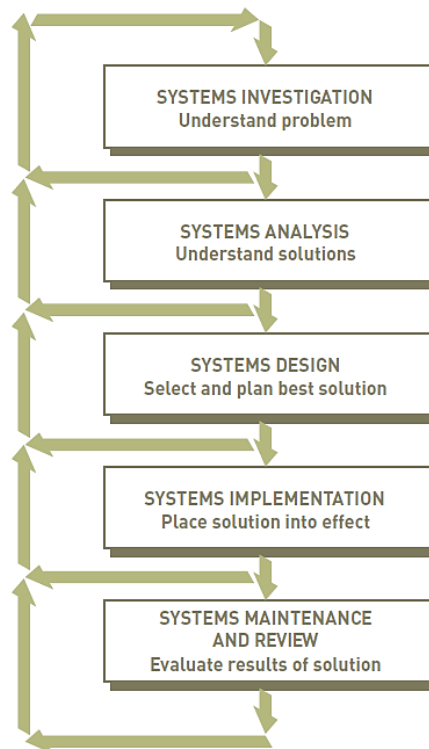
Fig(13)- An Overview of Systems Development

1. System Identification, Selection, and Planning (Investigation): The first phase of the systems development life cycle is system identification, selection, and planning for any projects at a given time due to limited resources, care must be taken so that only those projects that are critical to enabling the organization's mission, goals, and objectives be undertaken. The goal of system identification and selection is simply to identify and select a development project from all possible projects that could be performed. Organizations differ in how they identify and select projects. Some organizations have a formal information systems planning process where a senior manager, a business group, or IS manager, identify and assess all possible systems development projects that an organization could undertake.

2. System Analysis: The second phase of the system development life cycle is called system analysis, one purpose of the system analysis phase for designers to gain through understanding of an organization's way of doing things in the area for which the new information system will be constructed. The process of conducting an analysis requires many tasks or sub phases.

3. System Design: The third phase of the systems development life cycle is system design, during this phase the proposed system is designed, the details of the particular approach chosen are developed. Many different activities must occur during system design.

4. System Implementation: The fourth phase of the systems development life cycle is system implementation, it included different activities are:

  (a) One group of activities focuses on transforming the system design into a working information system that can be used by the organization. These activities include software programming and testing.

  (b) A second group of activities focuses on preparing the organization for using the new information systems. These activities include system conversion, documentation, user training, and support.

5. System Maintenance: After an information system is installed, it is essentially to maintain. In the maintenance phase, one person within the systems development group is responsible for collecting maintenance requests from system users. After they are collected, requests are analyzed so that the developer can better understand how the proposed change might alter the system and what business benefits and necessities might result from such a change. If the change request is approved, a system change is designed and then implemented.