Information Systems: Definitions and Components

What Is an Information System?

Information system has been defined in terms of two perspectives: one relating to its function; the other relating to its structure. From a **functional perspective**; an information system is a technologically implemented medium for the purpose of recording, storing, and disseminating linguistic expressions as well as for the supporting of inference making. From a **structural perspective**; an information system consists of a collection of people, processes, data, models, technology and partly formalized language, forming a cohesive structure which serves some organizational purpose or function.

The functional definition has its merits in focusing on what actual users - from a conceptual point of view- do with the information system while using it. They communicate with experts to solve a particular problem. The structural definition makes clear that IS are socio-technical systems, i.e., systems consisting of humans, behavior rules, and conceptual and technical artifacts.

An information system can be defined *technically* as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products.

Three activities in an information system produce the information that organizations need to make decisions, control operations, analyze problems, and create new products or services. These activities are input, processing,

and output. Input captures or collects raw data from within the organization or from its external environment. Processing converts this raw input into a more meaningful form. Output transfers the processed information to the people who will use it or to the activities for which it will be used. Information systems also require feedback, which is output that is returned to appropriate members of the organization to help them evaluate or correct the input stage.
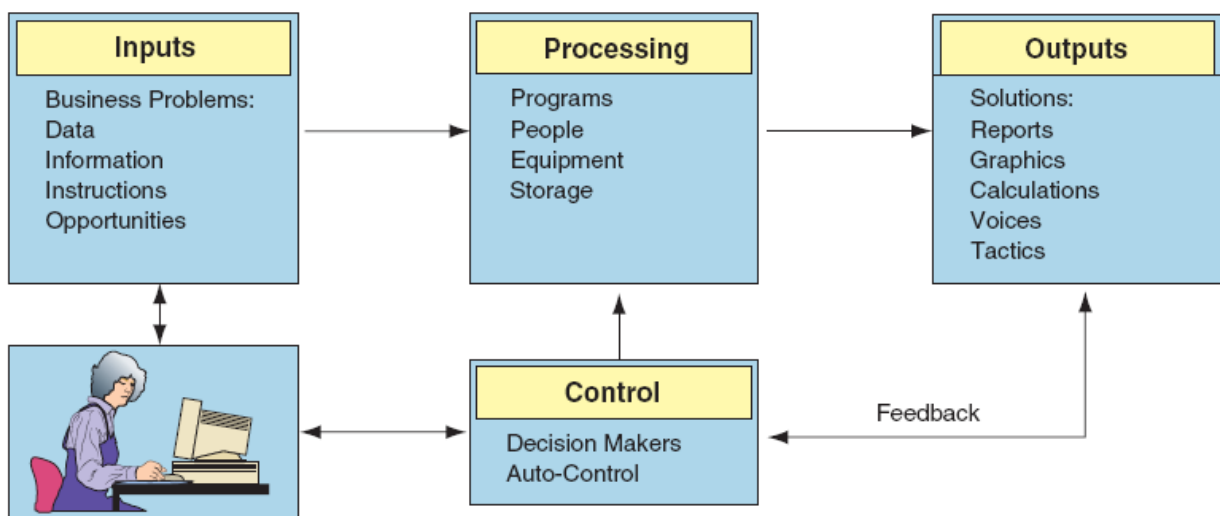

Figure 6: Functions of an information system

What Is A Computer-Based Information System?

A computer-based information system (CBIS) is an information system that uses computer technology to perform some or all of its intended tasks. Such a system can include as little as a personal computer and software. Or it may include several thousand computers of various sizes with hundreds of printers, plotters, and other devices, as well as communication networks (wire-line and wireless) and databases. In most cases an information system also includes people. The basic components of information systems are listed below. Note that not every system includes all these components.

Components of Information Systems

1. Resources of people: (end users and IS specialists, system analyst, programmers, data administrators etc.).

2. Hardware: (Physical computer equipments and associate device, machines and media).

3. Software: (programs and procedures).

4. Data: (data and knowledge bases), and

5. Networks: (communications media and network support).

People Resources

- End users: (also called users or clients) are people who use an information system or the information it produces. They can be accountants, salespersons, engineers, clerks, customers, or managers. Most of us are information system end users.

- IS Specialists: people who actually develop and operate information systems. They include systems analysts, programmers, testers, computer operators, and other managerial, technical, and clerical IS personnel. Briefly, systems analysts design information systems based on the information requirements of end uses, programmers prepare computer programs based on the specifications of systems analysts, and computer operators operate large computer systems.

Hardware Resources

- Machines: as computers and other equipment along with all data media, objects on which data is recorded and saved.

- Computer systems: consist of variety of interconnected peripheral devices. Examples are microcomputer systems, midrange computer systems, and large computer systems.

Software Resources

Software Resources includes all sets of information processing instructions. This generic concept of software includes not only the programs, which direct and control computers but also the sets of information processing (procedures). Software Resources includes:

- System software, such as an operating system

- Application software, which are programs that direct processing for a particular use of computers by end users.

- Procedures, which are operating instructions for the people, who will use an information system. Examples are instructions for filling out a paper form or using a particular software package.

Data Resources

Data resources include data (which is raw material of information systems) and database. Data can take many forms, including traditional alphanumeric data, composed of numbers and alphabetical and other characters that describe business transactions and other events and entities. Text data, consisting of sentences and paragraphs used in written

communications; image data, such as graphic shapes and figures; and audio data, the human voice and other sounds, are also important forms of data. Data resources must meet the following criteria:

- Comprehensiveness: means that all the data about the subject are actually present in the database.

- Non-redundancy: means that each individual piece of data exists only once in the database.

- Appropriate structure: means that the data are stored in such a way as to minimize the cost of expected processing and storage.

The data resources of IS are typically organized into:

- o Processed and organized data-Databases.

- o Knowledge in a variety of forms such as facts, rules, and case examples about successful business practices.

Network Resources

Telecommunications networks like the Internet, intranets, and extranets have become essential to the successful operations of all types of organizations and their computer-based information systems. Telecommunications networks consist of computers, communications processors, and other devices interconnected by communications media and controlled by communications software. The concept of Network Resources emphasizes that communications networks are a fundamental resource component of all information systems. Network resources include:

- Communications media: such as twisted pair wire, coaxial cable, fiber-optic cable, microwave systems, and communication 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 communications network. Examples include communications control software such as network operating systems and Internet packages.
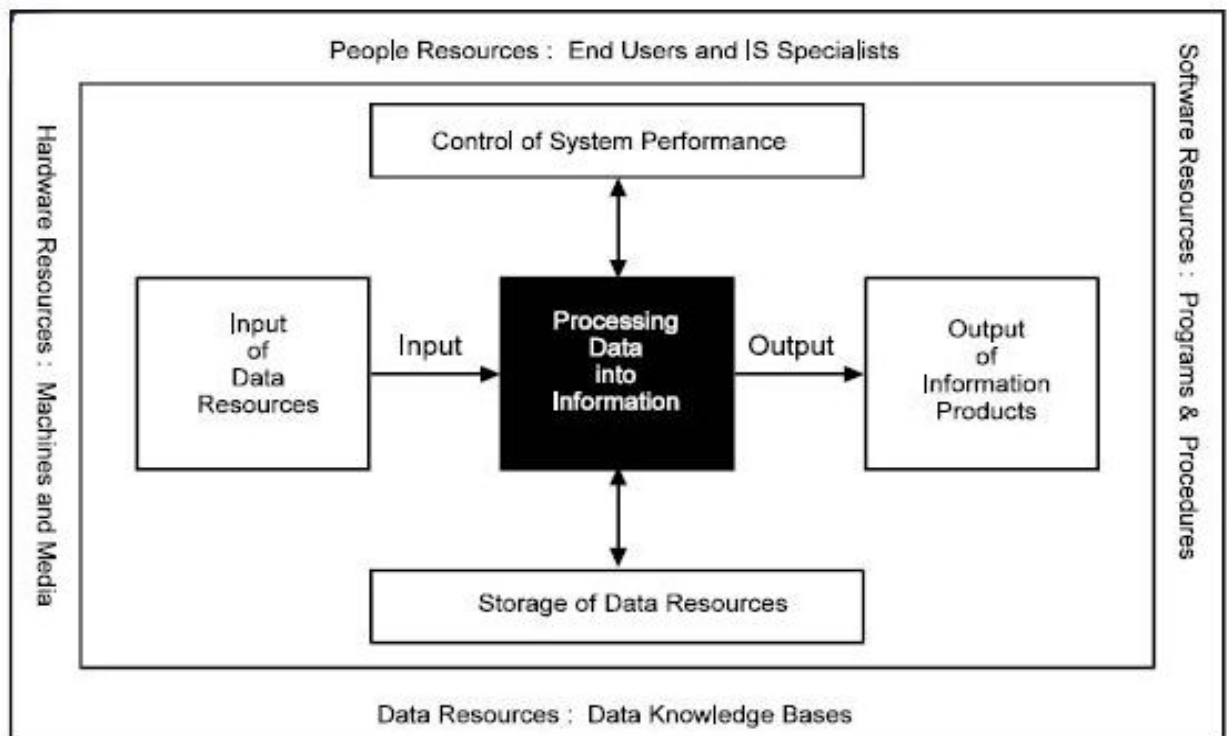

Figure 7: Components of Information System

Difference between Computers and Information Systems

Computers provide effective and efficient ways of processing data, and they are a necessary part of an information system. An IS, however, involves much more than just computers. The successful application of an IS requires an understanding of the business and its environment that is supported by the

IS. For example, to build an IS that supports transactions executed on the New York Stock Exchange, it is necessary to understand the procedures related to buying and selling stocks, bonds, options, and so on, including irregular demands made on the system, as well as all related government regulations.

In learning about information systems, it is therefore not sufficient just to learn about computers. Computers are only one part of a complex system that must be designed, operated, and maintained. A public transportation system in a city provides an analogy. Buses are a necessary ingredient of the system, but more is needed. Designing the bus routes, bus stops, different schedules, and so on requires considerable understanding of customer demand, traffic patterns, city regulations, safety requirements, and the like. Computers, like buses, are only one component in a complex system.

Information Technology and Information Systems

Information technology broadly defined as the collection of computer systems used by an organization. Information technology, in its narrow definition, refers to the technological side of an information system. It includes the hardware, software, databases, networks, and other electronic devices. It can be viewed as a subsystem of an information system. Sometimes, though, the term information technology is also used interchangeably with information system.

The term IT in its broadest sense used to describe an organization's collection of information systems, their users, and the management that oversees them.

A major role of IT is being a *facilitator* of organizational activities and processes. That role will become more important as time passes. Therefore, it is necessary that every manager and professional staff member learn about IT not only in his or her specialized field, but also in the entire organization and in inter-organizational settings as well.

Obviously, you will be more effective in your chosen career if you understand how successful information systems are built, used, and managed. You also will be more effective if you know how to recognize and avoid unsuccessful systems and failures. Also, in many ways, having a comfort level with information technology will enable you, off the job and in your private life, to take advantage of new IT products and systems as they are developed. (Wouldn't you rather be the one explaining to friends how some new product works, than the one asking about it?) Finally, you should learn about IT because being knowledgeable about information technology can also increase employment opportunities. Even though computerization eliminates some jobs, it also creates many more.

The demand for traditional information technology staff—such as programmers, systems analysts, and designers—is substantial. In addition, many excellent opportunities are appearing in emerging areas such as the Internet and e-commerce, m-commerce, network security, object-oriented programming, telecommunications, multimedia design, and document management.

According to a study by the U.S. Bureau of Labor Statistics, each of the top seven fastest-growing occupations projected through 2010 fall within an IT- or computer related field. These top seven occupations are:

1. Computer software applications engineers

2. Computer support specialists

3. Computer software systems engineers

4. Network and computer systems administrators

5. Network systems and data communications analysts

6. Desktop publishers

7. Database administrators

To exploit the high-paying opportunities in IT, a college degree in any of the following fields, or combination of them, is advisable: computer science, computer information systems (CIS), management information systems (MIS), electronic commerce, and e-business. Within the last few years, many universities have started e-commerce or e-business degrees. Many schools offer graduate degrees with specialization in information technology.