

# National University of Computer & Emerging Sciences

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## Lab Manual

### Introduction to Information & Communication Technologies

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## Week-01

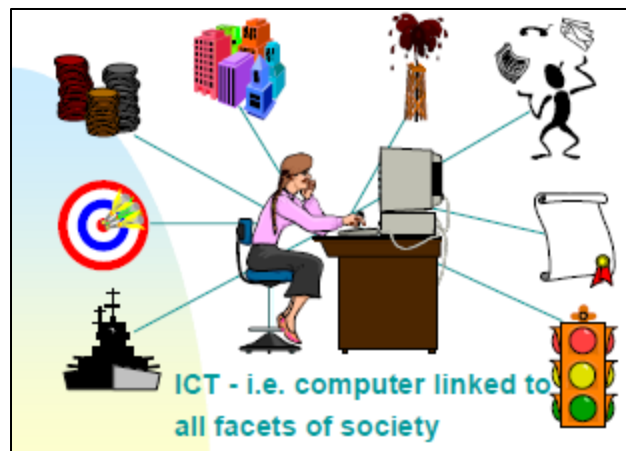
### What are ICT?

Information Communications Technologies (ICT) - technologies that enable society to create, collect, consolidate, communicate, manage and process information in multimedia and various digital formats for different purposes i.e. computing and telecommunications technologies like the personal computer, CD-ROM, cable TV, cellular phones and the Internet.

### Impact of ICT on society

Developments in ICT have brought about the merger of the computing, information, communications, entertainment, and mass media industries thereby providing a means of exchanging information anytime, anywhere in the digital format used by computers.

This technological convergence has brought about an enormous impact on the way we live, work, think and play. These changes are quite prevalent in our everyday lives such as the use of e-mail and cellular phones at home and in the workplace and also linked to all facets of society: business, education, military, recreation, transportation, communication, scientific exploration, knowledge management, etc... as shown in this image.



### Industry and government response to the information society

- Increased production and availability of more powerful ICT hardware and software
- Provision of more efficient national and global information infrastructures for more efficient access and delivery of information
- Increased production and publication of multimedia digital information

Computing and telecommunications industries have (of course) responded enthusiastically to these changes and have been continuously working and introducing products into the market that are more powerful than the previous one. More innovative and useful applications of technology have found their way both into the corporate world and as consumer products.

Realizing the importance and the role that ICT play in society, each country has developed or is in the process of creating a policy, or is already implementing its own national information infrastructure initiatives that aim to use ICT as a vehicle for economic growth and stability. For example, to name just a few in **Asia**, *Singapore's IT2000 - A Vision of an Intelligent Island*, *Malaysia's Multimedia Super Corridor (MMSC)*, and the *Philippines' Information Infrastructure Policy Study (PIIPS)*.

### **Activity 1-1:**

Google and read it, how ICT has changed the economic growth of above mentioned countries of Asia?

### Effects of these developments on the user community

- Increases the level of technology literacy
- Increases demand for better and faster access to information
- Aggravates discrepancies between the information rich and information poor.

## How do computers work?

### What is a computer?

A computer is a machine with electronic and electromechanical parts. It is programmable and is capable of performing the following basic computing functions:

- Accept data (input)
- Process data
- Generate output (information)
- Store data/information
- Retrieve/send data/information

### Development of computers

The beginning of the commercial computer age began on June 14, 1951 with the delivery of UNIVAC--Universal Automatic Computer to the U.S. Bureau of Census. Prior to this, however, Charles Babbage invented the Difference Engine and conceived of another machine called the Analytical Engine. The latter had all the components of the computer: input, output, processing and storage. Babbage is called the father of computers.

### Five generations of computers

**First generation, 1951-1958:** Vacuum tubes were used as the internal computer components, punched cards and magnetic tapes for storing data, and machine language for programming.

**Second generation**, 1959-1964: Transistors replaced vacuum tubes, assembly language and high level languages replaced machine language, and the removable disk pack replaced punched cards. Transistors enabled manufacturers to produce smaller computers.

**Third generation**, 1965-1970: Integrated circuits --complete electronic circuits on a silicon chip were developed. ICs led to the production of even smaller computers called mini computers. Software became more sophisticated and interactive processing possible.

**Fourth generation**, 1971-present. The microprocessor or computer on a chip was developed. This made PCs, and other applications possible (calculators, banking, etc.)

**Fifth generation** - present and beyond. Still difficult to define since most of the technology is in its infancy - artificial intelligence, neural systems, voice recognition - while others are still at the experimental stage, such as quantum computers.

### Elements of a computer system

1. **People** - the most important part and beneficiary of a computer system, generally categorized as either end-users or developers.
2. **Procedures** - are descriptions of how things are done, i.e. manuals, documentations ...
3. **Data/Information** - raw facts (data) and processed data (information) that are used to produce the desired result.
4. **Hardware** - the physical element of a computer system categorized according to the basic operations performed: input, processing, output, storage and communications.
5. **Software** - provides the step-by-step instructions that tell the computer what to do. Generally software is divided into system software and application software.
6. **Communications** - refers to the electronic transfer of data from one place to another

### Types of computer systems

In general, computers are sorted according to physical size and processing capabilities.

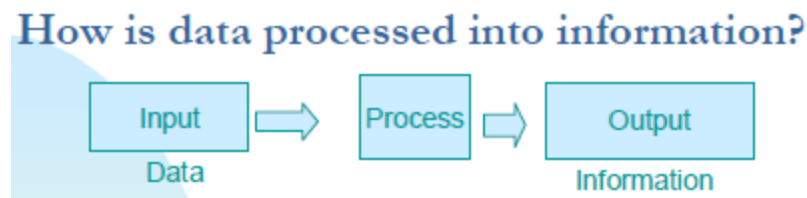
1. **Supercomputer** - are the fastest and highest capacity computers
2. **Mainframe computer** - less powerful, the most common in the late 1960's
3. **Minicomputer** - also known as workstations mostly for scientific calculations
4. **Microcomputer** - or personal computer, most widely used: Desktop, Laptop, Palm
5. **Microcontroller** - embedded computers installed in smart appliances, toys, etc.

### How is data represented in the computer?

Computers represent data as two-state systems. This means that the computer recognizes only two numbers, 0 and 1. Larger numbers, letters and special characters are formed using combinations of 0 and 1. Each of these two numbers is called a bit from the words binary digit. The combination of bits to form meaningful characters or numbers is called a byte.

### Coding schemes are used to form meaningful bytes of data

There are usually 8 bits in a byte. The coding scheme ASCII (As-key) and ASCII-8 or extended ASCII has been adopted as a standard by the US Government and by computer manufacturers. ASCII can have 128 combinations of seven bits each while ASCII-8 can have as many as 1256 combinations. The computer using this coding scheme will interpret the words, statements and paragraphs formed by these characters as a string or combination of bytes.



### Role of computer systems in the information cycle

1. Accept data through input devices
2. Process data using microprocessors
3. Store data for interactive use in the RAM and for longer periods of storage in the ROM and hard disks
4. Output data through output devices.

In a computer system, data is captured and transformed into electronic signals that computers understand --into bytes as we have discussed earlier. Then data is processed through the central processing unit and main memory that manipulates data and transformed into information. The processed data produces an output that is displayed through the monitor and/or in printed form. That output could also be saved in storage devices. Of course, this is an oversimplified explanation of the very complex process happening within a computer but the general concept is basically the same