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Summary
1.1 HISTORICAL BACKGROUND OF COMPUTERS

Charles Babbage is generally considered as the first person to propose the concept of modern computer. In 1833, this English mathematician outlined in detail his plans for an "analytical engine", a mechanical steam driven computing machine. Though he produced thousands of detailed drawings before his death in 1871, the machine was not built. Babbage had designed the World's first general purpose stored programme digital computer, and his ideas were too advanced for the technology of his time.

Almost a hundred years passed before the ideas outlined by Babbage in 1833 began to be developed. Dr. Vannevar Bush of Massachusetts Institute of Technology built a large scale electro mechanical analog computer in 1925. The first large scale electromechanical digital computer was developed by Dr. Howard Aiken of Harvard with the support of IBM in 1944. Aiken's Automatic Sequence Controlled Calculator (nicknamed, Mark I) embodied many of the concepts of Charles Babbage and relied heavily on the concepts of IBM's punched card calculator developed in the 1930's.
The First Computer

The first electronic digital computer, the ENIAC (Electronic Numerical Integrator And Calculator) was developed by John Mauchly and J.P. Eckert of the University of Pennsylvania in 1946. The ENIAC was electronic since it utilised over 18000 vacuum tubes instead of the electromechanical relays of the Mark I. The ENIAC was built to compute artillery ballistic tables for the US Army. It could complete in 15 seconds a trajectory computation that would take a skilled person with a desk calculator about 10 hours to complete. However, the ENIAC was not a "stored program" computer and utilised the decimal system. Its processing was controlled externally by switches and control panels that had to be changed on each new series of computation.

The first stored program electronic computer EDSAC (Electronic Delayed Storage Automatic Computer) was developed under the direction of M.V. Wilkes of University of Cambridge in 1949. The EDSAC and the first American stored program computer, the EDVAC (Electronic Discrete Variable Automatic Computer) which was completed in 1952, were based on the concepts advanced in 1945 by Dr. John Van Neumann of the Institute for Advanced Study in Princeton, New Jersey.
He proposed that the operating instruction or program of the computer be stored in a high speed internal storage unit or memory and that both data and instructions be represented internally by the binary number system rather than the decimal system.

1.2 BASICS OF COMPUTER

Computer System: A computer consists of hardware and software. Computer hardware is the equipment and devices that make up a computer system. The hardware can be subdivided into four major categories: the central processing unit, the peripheral equipment, auxiliary equipment, and media and materials.

Computer software includes all types of programs which direct and control computer hardware in the performance of data processing functions.

THE ORGANISATION OF A COMPUTER

Basically, a computer has four units 1) Input Unit, 2) Memory, 3) Central Processing Unit, and 4) Output Unit (Figure 1.1). In order to understand the functions of various units of a computer, they can be compared with different parts of a human system.
BLOCK DIAGRAM OF A COMPUTER

Figure - 1.1
1. Input Unit

The Input Unit of a computer is similar to our 'eyes' and 'ears' through which we receive information. In a computer, information is read through devices such as keyboards, optical readers, etc which act as its eyes and ears.

2. Memory

The Memory of a storage unit of a computer is equivalent to our memory controlled by the brain, where information is registered. In this, instruction, data, intermediate results of any calculation and final output are stored and they can be retrieved whenever necessary.

3. Central Processing Unit

The Central Processing Unit (CPU) is like our brain. It consists of two units called control unit, and Arithmetic and logic unit. Just like the rear part of our brain which controls the main automatic functions of our body, this unit controls and directs the other units of a computer. The Arithmetic and Logic Unit is like the front part of our brain which performs the higher mental functions like calculations, logical reasoning and so on.
4. Output Unit

The Output Unit of a computer is like our mouth and hand with which we speak and write respectively. The computer generates the result using a printer, a television screen, etc.

Besides, there are some other parts of a computer called auxiliary or peripheral devices. Sometimes, a very large quantity of data may have to be stored and processed by a computer but the space available in the main memory may not be sufficient. In such cases, there will be a need for some storage units in addition to the main memory. A unit which provides such an additional storage is called an auxiliary memory or peripheral memory. Examples are Floppy disk, Hard disk, Magnetic tape, Cassette tape, etc.

DEFINITIONS:

Hardware

The electronic circuits used in building the computer is known as the hardware of a computer. Hardware is the tangible equipment and is the most visible part of a computer. Examples: Floppy disk, Cathode ray tube, Printers, etc.
Software

Software is the intangible part of a computer. It consists of the instructions that set the hardware to do what we desire it to do.

Computer software may be classified into two broad categories as application software and system software. Application software is the set of programs necessary to carry out operations for a specified application. For example, programs to solve a set of equations, process examination results, etc constitute application software. System software, on the other hand, is the general programs written for the system which provide the environment to facilitate the writing of application software. Programming language translators are examples of system software.

Operating System

It is usually stored in the external storage on floppy disks and contains the logic necessary to build and store files, access directories of files and so on. The operating system is a major concern to the designer.
Languages

Languages are the set of instructions that are available to users for writing programs. The most common language on micro computers is usually BASIC (Beginners All purpose Symbolic Instruction Code). It is called a high level language as the commands are sensible english words such as "print", "input" and so on. Other languages in commercial use are Fortran (Formula Translation) and COBOL (Common Business Oriented Language).

Systems

When hardware and software are assembled together and address a particular problem, the total configuration is called a system. Hence, a system constitutes the hardware, the operating system, the language, the programs and the logic required to do the assigned task. Without the logic, the balance could be called a 'hardware - software package' but not a system.
SELECTION OF HARDWARE

This should be governed by several overriding factors such as:

- Needs,
- Compatibility,
- Durability,
- Service,
- Deal r reliability,
- Vendor stability, etc.

Of primary importance is the compatibility of the hardware pieces. Durability is a second major concern to the business systems designer.

SELECTION OF SOFTWARE

The selection criteria focus on four broad considerations. They are:

- Compatibility,
- Documentation,
- Service and support, and
- Vendor stability and reliability.
If the components cannot satisfactorily communicate with the user, they are unacceptable. All hardware and software must be fully documented. There must be manuals that explain how to use each element. Cross reference summaries and indices are also essential. Service and support (whether they are done by manufacturer or dealer) are very important.

CAPABILITIES OF COMPUTER

Computers are capable of doing the following:

1) Automaticity:

   A computer is automatic. Once appropriate instructions are given, it performs all the necessary tasks until it meets the 'stop' instruction.

2) Speed:

   Computers can carry out instruction in less than a millionth of a second. For instance, a small computer can sort a set of hundred names in less than a hundredth of a second.
3) Accuracy:

In addition to their high speed of operation, computers can also calculate very accurately. If mistakes occur in any calculation, they can be easily said to be due to human errors.

4) Repetitiveness:

Computers are capable of performing any task given to them repetitively.

5) Storage Capacity:

Computers have the capacity to store large quantities of instructions and data and supply the stored information when asked for the same.

6) Versatility:

Computers can carry out the tasks given to them using a small set of elementary instructions. Even for a powerful machine, the instruction need not be very many in number.
LIMITATIONS

1. Lack of Commonsense:
   
   Computer is only a tool. It cannot think on its own.

2. Inability to correct:
   
   Correct instructions are to be given to the computers. Because, a wrong instruction brings a wrong result. Computers are not in a position to correct wrong instructions.

3. Dependence on human instructions:

   A computer cannot generate any information on its own. It can only do what it is told to do.

CLASSIFICATION OF COMPUTERS:

Computers can be classified into a number of categories on the basis of type, size and generation.

Type-wise Classification:

There are two basic types of computers, the analog and the digital along with a third type, the hybrid computer which combines analog and digital capabilities. The basic difference between the analog and the digital computer is that the digital computer counts discrete units while the analog computer measures continuous physical magnitudes.
Analog computers are typically used to process the data arising from an ongoing physical process such as scientific or engineering experiments and manufacturing processes and are also used in military weapons systems.

Digital computers can be used for business and scientific data processing, industrial process control and for many other applications. The hybrid computers are used for special applications where data may be collected and measured in analog form and analysed further by digital processing.

Size-wise Classification
Computers are also classified on the basis of their size. Size denotes not only their physical size but also their ability to process large volume of data or handle large computational problems. Computers are frequently classified as Micro, Mini, Supermini, Mainframe and Super categories.

Micro computers or micros are the smallest units. They may be the tiny special purpose devices dedicated to carry out a single task such as, controlling an automobile ignition system or they may be the more visible and familiar personal computers ranging from note book size to desktop size that we can use in countless ways. Micros are capable of performing the same operation and use the type of instructions which the much larger computers perform and use.
Mini computers or Minis are also small and general purpose systems but unlike most micros, they typically serve multi users. Usually they are more powerful and more expensive than micros although the performance of some newer micros surpasses the capabilities of some older minis. In physical size, the mini computers vary from desktop models to the size of small file cabinets.

Superminis are larger and more versatile than mini computers and have greater input/output and storage capabilities.

Main frame are larger, faster and can handle more input/output and storage devices than the supermini computers.

Super computers are designed to process complex scientific applications. These are the largest, fastest and most expensive systems.

Generation-wise Classification

The UNIVAC I (Universal Automatic Computer), the first general purpose electronic digital computer to be commercially available, marks the beginning of first generation of electronic computers. A unique feature of the UNIVAC I was the use of magnetic tape as an input and output medium.
The most popular first generation computer was the IBM 650 which had a magnetic drum memory and utilize punched cards for input and output. The first generation computers were quite large and produced enormous quantity of heat due to the use of vacuum tubes.

The replacement of vacuum tubes by transistors and other solid devices marked the introduction of second generation computers in 1959. The second generation computers were significantly smaller and faster and more reliable than the first generation machines. The use of magnetic cores as the primary internal storage medium and the introduction of removable magnetic disk packs were other major developments of the second generation. The most popular second generation computer was the IBM 1401. The second generation also resulted in the displacement of punched card machines by electronic computers in business data processing.

The introduction of IBM system 360 series computers in 1964 signalled the arrival of third generation computers. This generation featured the replacement of transistorized circuitry by integrated circuits in which all the elements of an electronic circuit are obtained on a tiny silicon wafer or chip. The third generation also featured improvements in speed, capacity and types of computer
storage and input/output devices and the widespread use of magnetic disk units. Other features were the emergence of "time sharing" and "data communication" applications, the ability to process several programs simultaneously through multiprogramming and the growth in importance of "software" as a means of efficient use of computers. "Operating systems" of computer programs were developed to supervise computer processing and high level programming languages such as FORTRAN (Formula Translator) and COBOL (Common Business Oriented Language) greatly simplified computer programming.

The fourth generation computers have begun since 1970 when several computer manufacturers announced the introduction of new computer systems. Magnetic core memories were replaced by semiconductor memories.

The trend towards increased microminiaturization significantly reduced the size and power requirements of the fourth generation computers. Other impressive developments are "microprogramming" and "virtual memory". These developments have greatly increased the speed, versatility and capacity of fourth generation computers.

The fifth generation computers have begun in the 1980's with the introduction of multimedia and artificial intelligence.
1.3 COMPUTER APPLICATIONS

Computers can be used for variety of applications. Some of the areas where computers are used are enumerated below.

At Home

With the fall in the prices of home computers and availability of different models of home computers, they are becoming increasingly common electronic equipment in many homes. These home computers are largely used for entertainment for playing video games and to some extent, for education. These can also assist home management.

For Education

The boom in the personal computer industry has made a significant impact in the field of education.

The use of computers in education can be broadly classified into two categories:

1) Computer assisted instruction, and
2) Non-teaching uses of computers.
Computer assisted instruction: Computers are used not only for teaching computer programming but also for teaching a wide variety of subjects ranging from language teaching to advanced science subjects.

Non-teaching uses of computers: Apart from serving as teaching aids, personal computers in schools can be used for many other jobs. They can be used for maintaining records of attendance and fees, for calculating the school budget, etc. They can also assist the teachers in designing the curriculum, allocating class rooms, scheduling meetings, printing out school reports, etc.

For Word Processing

The word processing facility of a personal computer can be used by corporate executives, writers and many others for preparing reports, documents, etc.

For Information Retrieval

One of the major applications of computers is in information retrieval. Retrieval is useful in many areas. It is used by lawyers to refer to past
court decisions and procedures; by researchers to get timely information on publications in scholarly journals in their area of interest. In all these cases, the required information is organized appropriately and stored in a computer's disk. This consolidated information is called database.

For Medicine

The application of computers in medicine can be studied under five major divisions. They are: hospital administration, patient care, laboratory assistance, medical information and new horizons.

For Hospital Administration

Employee record could be maintained using magnetic tape on a computer. Other applications are, scheduling the duty of doctors, nurses and other staff, dispensing of drugs, emergency information like contact telephone numbers of doctors and nurses, availability of ambulance, etc. Computers could also be used in catering departments of hospitals for keeping a record of equipments used by the doctors, and so on. They can be used for keeping details of patients treated and for booking appointments for patients with doctors.
For Patient Care

Computers can assist the patients and the doctors in the diagnostic process and maintenance of personal files. They can also help in patient monitoring.

For Laboratory Assistance

Computers are increasingly used in the fields of biochemistry, haematology, bacteriology, serology, blood banks and unit analysis and in the examination of X-ray images.

For Medical Information Systems

Computers are used in Medical Research centres for projects such as design of artificial valves for human hearts, cancer research, detection of abnormalities in the human brain. They are also used in simulating models of heart, brain, etc.

For New Horizons

New advances are being made rapidly in the field of medicine. Computerized ECG's and Computerized Axial Tomography (CAT) are some examples.
For Banking

Some of the applications of computers in banks are automatic processing of cheques and maintenance of accounts of customers.

For Transportation

Computers are used in Airlines for reservations, for operation of aircraft by pilots, and at air traffic control for monitoring takeoffs, landings, positioning of the aircraft and also when the aircraft is in flight. Computers are also used for controlling road traffic signals.

For Fine Arts and Humanities

Computers are ideal for making animated cartoons. Computers can also help in different ways to generate drawings. Computers have entered the world of music also. They can help a creative composer in two ways. One way is in the production of composition, and the second is in the generation of actual sounds of instruments or human voices.

Computers are becoming important in the research work of Economists, Psychologists, Historians, Geographers and Sociologists.
CONCLUSION

In conclusion it may be said that there is no area of human activity wherein computer help cannot be sought. Computers can be used for variety of applications. Some of the areas of applications are home, education, word processing, information retrieval, medicine, banking, etc.
SUMMARY

This chapter deals with the historical background of computers, basics of computer and computer applications.

Charles Babbage is considered as the first person to propose the concept of Modern Computer. The first stored programme electronic computer was developed, under the direction of M.V. Wilkes, in 1949.

The computer consists of hardware and software. The four important units of a computer are: Input Unit, Memory, Central Processing Unit and the Output Unit.

Computers are classified into a number of categories on the basis of type, size and generations. Computers can be used for variety of applications. Computers are used for Home, Education, Word Processing, Medicine, Banking, Transportation, Fine arts, etc.