# THE EVOLUTION OF THE COMPUTER ELECTRONIC

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**During the last four decades computer industry has rapidly grown (expanded) and today computer scientists are conducting research to make the computers more efficient, more reliable and more simple to use. We can classify this rapid growth in to four generations.**

The present day electronic computer plays an important role in the society. It is very different from other machines used today.

Normally machines are designed to perform a specific task. But the computer is a multipurpose tool which help businessmen in their business activities (eg. keeping accounts and stocks), artists in drawing pictures, children in learning their subjects, scientists in research and development, mathematicians in model formulations etc. That is why the computer has become popular, and popular with types of people.

The brief description that we can give of the computer is to say that " a computer is a machine in many ways similar to other machines which run on electricity. It contains a number of parts that work together. It is designed to perform certain tasks."

A Computer has more features than the other machines. Some of them are speed, reliability, receiving and storing of data (memory), processing data and interactivity.

## From Early History

History of the electronically based calculators is relatively new about 40 years old. But if we talk about the history of computers it runs up to 1600 years.

The abacus, first used in Asia about 2000 years ago, is one of the earliest known devices to assist man in performing calculations but it merely acted as a storage medium using beads mounted on a frame.

It was as early as 1642 that the Frenchman Blaise Pascal developed a mechanical adding machine with rotating gear wheels. This principle was extended by Gottfried Leibnitz a German Mathe-

matician who demonstrated a machine capable of multiplication and division in 1694. These machines had to be prepared for each separate operation by its user. That is if the machine was expected to add, it gears had to be physically positioned for that function, a tedious process at the best.

In early 1800s J. M. Jacquard perfected a series of "punch cards" to alter loom settings and create a view patterns without further human invention. This was a recognizable forerunners of computer programs because they are affected what the machine did without changing the machine, in any way.

In 1823 Charles Babbage proposed to build a machine which was to use a 'mill' for calculating and punched cards for inputs.

However, the technology of the day was insufficient to complete the machine. That is man and the ideas are ahead of technology of that time.

For the 1890 US Census, Dr. Herman Hollerith developed a device that coded population data as punched holes: in a card while another device was able to sense and read this encoded data.

In 1896, Dr. Hollerith formed the Tabulating Machine Company to manufacture punched card equipment which together with some other Companies, became the Computing Tabulating Recording Company (CTR) in 1911. Thomas J. Watson became CTR President in 1914 and 1924 the Company's name was changed to International business Machines Corporation (IBM).

Until 1939, much of the computing machines were controlled by wired control panels, banks of switches, wheels, layers and relays.

## Electronic Computer

At this time (in 1930's -1940's ) the electronic value (known as vacuum tube) was widely used as a component in radio receivers.

Between 1939 and 1946 the university of Pennsylvania developed the first large scale computer - the eniac (electronic numerical intergrater and calculator). It occupied 1500 sq. feet and weight was about 20 tons. It used about 19,000 values. Main thing of this computer was the replacement of the electro magnetic relays by vacuum tubes. This was the birth of electronic data processing. Any how eniac was quite Fast, it could do 5000 addings per second. But it was not able to store instructions such as modern computers do. Instructions were outside and lay on the switches and plugged wires, instead it had to give directions through a manual setting of switches.

The great mathematician John Ven Numann collaborated with another two to build the electronic Discrete Variable Automatic Computer (EDVAC) which was the first stored program computer. What he does was he puts instructions to the computer just like data. It was the principal model of the digital computer.

The new electronic computers were powerful, large and very costly. Analysis observed that the entire needs of Britain could be served by 03 such machines and that of USA by 06.

The first computer produced on a commercial scale was the Univac I in 1951 which was first used in business by the General Electric Appliance Park, Kentucky 1954.

Commercial production of electronic computers became a success later when IBM which was selling punch card tabulating machines commenced marketing of computers.

## Development of the Computer Industry

During the last four decades computer industry has rapidly grown (expanded) and today computer scientists are conducting research to make the computers more efficient, more reliable and more simple to use. We can classify this rapid growth in to four generations.

## First Generation (1951-1958)

First generation computers were large, costly to buy, expensive to power and often unreliable. They used vaccum tubes but they are faster than earlier mechanical devices and very slow compared to today's computers. (Eniac contains 18,000 vacuum tubes and is rumoured to have dimmed lights of Philadelphia when it was turned on.) Instructions and data were entered into these computers through the medium of punch cards..The Instructions on the cards were coded in a 'symbolic language'. Symbolic language must be translated into machine language before being executed by the computer. The machine code was recorded as a series of tiny magnetized spots on a 'magnetic drum'. Once all the instructions are translated the computer could execute the program.

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## Second Generation (1959-1964 )

The introduction of transistors (which is a type of electrical circuitry, smaller, faster and more reliable than vacuum tubes) into computer technology led to the second generation of computers which were compact and more reliable than their vacuum tube predecessors. Computers of the second generation were smaller, faster and having a large storage capacity than first generation computers. To get larger storage the 'magnetic drum' was replaced by the 'magnetic cores'.

## Magnetic Core

Tiny iron oxide cores could be mag-netized clockwise or counter clockwise to represent bits of information..Second generation computers helped user with the languages such as COBOL and FORTRAN.

## Third Generation (1965-1971)

In mid 1960s new techniques of miniaturization gave rise to Solid Logic Technology (SLT) which had circuits etched on silicon chips. This was dawn on the third generation of the computers. In 1964 IBM System/360 ( a series of 6 different computers with 6 different main storage capacities ) was introduced and it was considered as a revolution in computer technology.

Third generation computers were the first to be accessible buy remote terminal (a terminal that is placed at a location distance from the central computer) - input / output devices that are electronically linked to main computers but located at long distances from them. Such terminals are called on-line terminals, which communicates directly with the computer.

Another example - NCR 395, Burroughs B 5500

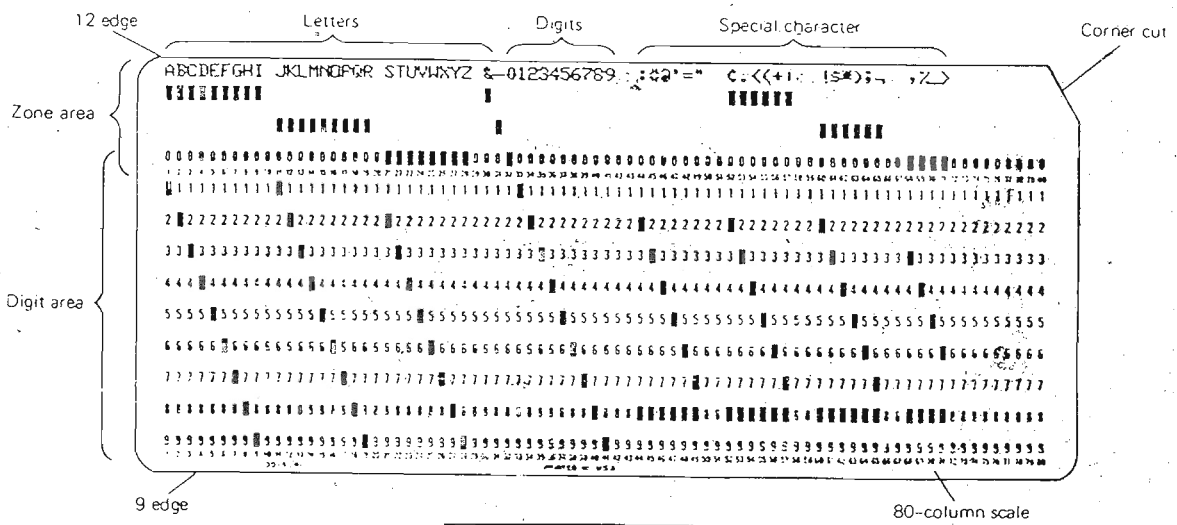
## Forth Generation (From 1972)

Miniaturization continues and reliability increases. Now semiconductor circuitry is used for main storage replacing the magnetic core and Medium Scale Integration (MSI) and Large Scale Integration (LSI) has allowed for smaller and cheaper computers to be marketed.

From the LSI technology sprang the very tiny devices called microprocessors (the central processing unit of a microcomputer; fits on a small silicon chip) which governs the functions of microwave ovens, sewing machines, thermostats and automobiles.

## Development In Storage Media

As we saw the size of the computer was reduced by using semiconductors, IC's MSI "technology & LSI technology. Let us examine how the storage media was developed.




80 Column Punch Card

Today we use diskettes to store our data or documents. But diskettes are not the only possible storage media. If we try to talk about storage media we should go back to the storage where Dr. Hermen Holanth used punch cards to store data. Let us go back to that point and discuss how and why storage media has changed and developed.

In 1887 Dr. Holenth - a young statistician was assigned the task to speed up the tabulation of data to be collected by the 1890 Cencus. As a result of that he developed an 80 column punch card which is given in the figure below.

The above punch card has 12 rows and 80 columns. 10 of those rows are numbered from 0 to 9. Other rows are not labelled and they are called 11th row and 12th row, and they use the area above the 0 row. The code that Holanth invented uses a zone area and a digit area. The digit area consists of the rows 0-9. The zone area is made up of the rows 0-12. Thus, 0 can be either a digit or a zone indicator.

Code rules are given below :

| Character | Holenth Code Rule |
|---|---|
| Digits 0-9 | Digit punched in any column |
| A-I | 12 zone punch + digit punch |
| J-R | 11 zone punch + digit punch |
| S-Z | 0 zone punch + digit punch |
| Special symbols | 1,2 or 3 punches |

Main problems of using the punch cards were :

a. Not reusable
b. Lot of space was taken to store cards

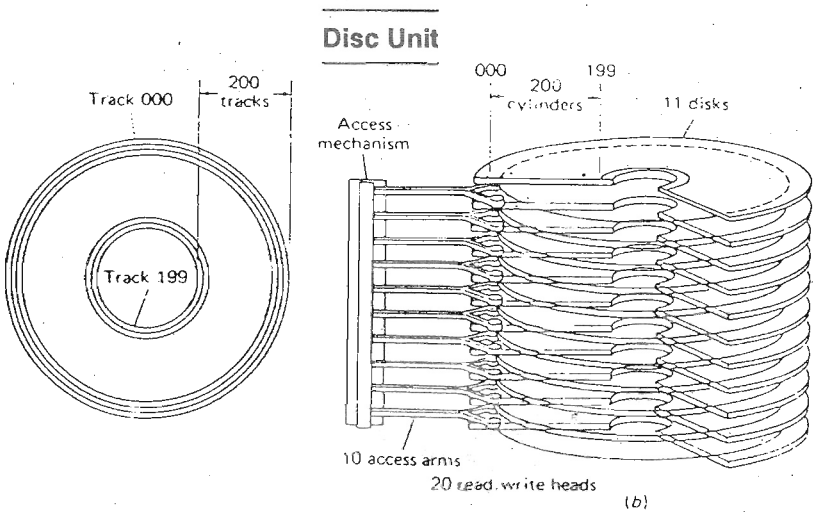
As a result of minimizing space birth of the 'punched paper tape' happened. Punched paper tape is a medium that can be used for inputs, sorting and outputs. Paper tapes became more popular since they were cheaper than punch cards.

Although we have solved the problem of spacing still the reusability problem is there. Because of that people thought about the magnetic tapes.

Magnetic tape was invented by the Germans during World War 11 for sound recording. Data were recorded on tapes in the form of small magnetized dots that can be changed to represent coded patterns of bits. Data recorded on a tape were stored on reels, cassettes or cartridges.

Now we feel the problem of reusability and space was solved. Since human beings try to make the output sophisticated they thought about the time that we spend to retrieve data. Their main point was if we want to access data at the end of the reel we have to read the whole tape to read data. As a solution to this, magnetic disks were introduced to the computers.

Magnet disks are thus circular metal plates coated on both sides with a recording material similar to that used in tapes. Data are stored in a code pattern of 0s and 1s. "1" represents the magnetized spots and "0" represents the absence of spots. As shown in the figure kits are aligned along tracks that forms concentric circles on a disk surface. In some systems tracks are divided into sec- tors like blocking on tape blocking of records on disks makes them more efficient.




Now the problem arises that moving a magnetic disk is quite difficult. It says people requested for movable storage media. As a result of that diskettes came to our hands in the sizes of 8", 5 1/4" and 3 1/2".

Here I have discussed the development of the storage up to now. Tomorrow's storage media may be even more advanced.