

PERSPECTIVES IN ACADEMIC LIBRARIANSHIP - 3

**ACADEMIC LIBRARY
AUTOMATION**

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Introduction to Computers.

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1. Computer and the Human Brain.

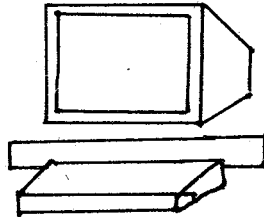
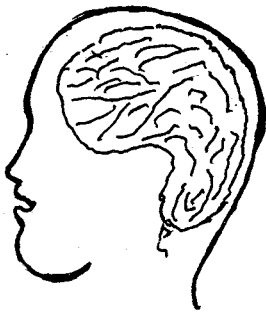
Computers have occupied a prime position in any major activity whether it be science, engineering, office automation or banking. The reason for this can be easily gauged when one compares the functions of human brain with that of the computer. It should however be noted that computers cannot and will never replace human beings, since they cannot think. But the comparison will however help to identify areas in which computer can augment human activity. Figure 1 gives the different features of a human brain and that of a computer. Looking at these features, three specific points emerge. First and foremost among these is that the brain of human being is catering to a variety of problems which he or she is exposed to in day-to-day life, whereas the computer does not cloud itself with other activities once it takes up the job. The second feature is related to the storage and retrieval of information. Whereas human brain stores information on variety of topics related to him/her physically or mentally, the computer stores information related to a job as directed to by the user. Retrieval of information from the human brain is again subjective and may be very little or impossible. Computers offer an excellent alternative to this since any information which goes into the computer can be retrieved in a fraction second. The last significant factor which distinguishes human beings from computers is the proneness of human beings to error either in storage, retrieval or manipulation of information. Computers do not have this error-proneness, as they can act according to the instruction given by the user in storing, retrieving and processing information without any error except in case of power failure.

2. An Indispensable Aid.

The factors explained in the earlier para alone are sufficient to appreciate the necessity and the need for the computer to aid human activity and it is not a surprise that computers which were occupying the prestigious corridors of scientists in the early fifties have now come down to the level of ordinary human beings; so much so they are indispensable in any modern environment. To quote Asimov, these days one should not be afraid of computers but to the lack of them. It is interesting to trace the development of computers over the last

- Social
- Physical
- Environmental
- Family
- Official
- Others

- Input
- Process
- Output



HUMAN BRAIN

- * Error Proneness
- * Variety of Issues
- * CAN THINK
- * Time delay or absence
- * Direct Access

COMPUTER

- * Almost error free
- * Single use
- * CANNOT THINK
- * Faster
- * Data Dependent
- * Input Information Precise
- * Efficient
- * Streamline
- * Abuse Possible
- * Not a panacea for everything.

FIG.1 FEATURES OF HUMAN BRAIN AND COMPUTER

four decades and the present paper touches briefly on some of the milestones in this development and as such cannot be taken as a complete documentation on this.

3. Historical Development.

Computers were initially known as calculators, even though the first human made calculator, abacus had not had that name. After abacus, which was in vogue even before the birth of Christ, subsequent developments to aid calculations came very much later. These relate to the Napier Bonus and the sort and came a few centuries back. After the invention of the mechanical calculator, the human mind was very much preoccupied in generating a computer rather than a calculator. The forefather for the first computer happens to be Charles Babbage whose difference engine occupied nearly a room of 10' x 14' x 9'. But he triggered a series of developments which are complementary to the developments taking place in other areas of science. Babbage difference engine completed in 1812 set in the trend for more powerful calculators/ computers using storage tubes. Further the memory of these computers also tended to show an increase. But the significant milestone in this development is the use of the Silicon and Semiconductor memories. Once Silicon and Semiconductor technology were perfected, the development has been phenomenal and since 1965 no other technology has advanced as much as computer technology. Significant pointers to indicate these are the size and price reduction of a computer and awesome increase in power of computer. These are illustrated in figure 2. Large Scale Integration (LST), Printed Circuit Board (PCB), Very Large Scale Integration (VLST), and Microcomputer (PC) have all become part of these developments. The hardware which forms the core of any computer has undergone significant changes over the last two decades and lot of things are in store for future also. Wafer technology, Fibre optics, Bubble Memory and Biochip are some of the new developments being ushered in this area. The tendency to combine hardware and software resulting in what is known as firmware is also getting popular and number of companies are offering this technology which brings the computer closer to the user. The day is not far when computer will become the only means to lead the various activities of anyone's life.

4. Components of the Computer.

Basically any computer consists of four essential modules :

* Central Processing Unit (CPU)

a) Milestones in Computer Developments

Abacus == Napier Bones == > Gunther Scale == >
(1000 B.C.)

Mechanical Calculator == > Babbage difference engine == >
(Pascal, 1642) (1812)

ENIAC == > UNIVAC == > IMB650 == > Silicon/Semiconductor == >
(1951) (1954)

IMB 1401 == > IMB 1620 -> LSI -> PCB -> VLSI ->

WAFER -> MICROPROCESSOR -> Bubble Memory.....

Size/Price 10^5 to 10^7 Power Increase 10^6 - 10^9
Reduction

b) Generation in Computer Development

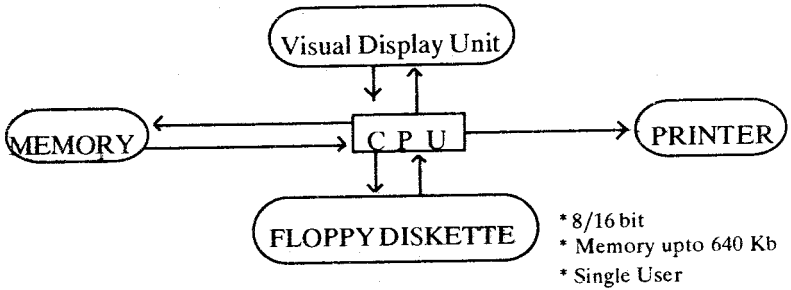
First Generation	upto 1959	Vacuum Tubes
Second Generation	upto 1964	Semiconductor Silicon
Third Generation	upto 1970	PCB,LST
Fourth 'generation	upto 1975	Mini& Microcomputers
Fifth Generation	Personal Computer

FIG. 2. DEVELOPMENT IN COMPUTER TECHNOLOGY

- * Input Device
- * Output Device
- * Memory and Auxiliary Storage

All these four modules have undergone considerable changes over the last thirty years. The Central Processing Unit (CPU) is the heart of the computer and contains electronic circuitry for performing arithmetic and logical operations and for controlling the operation of all the peripherals. The peripherals are those units which accept input, print output, store information, retrieve information, process and plot information and are always subservient to CPU. The input devices which started with cards in which the information is punched by a series of holes, has now become entirely operational through Visual Display Units (VDU). These VDUs with keyboards are nothing but picture tubes which give out the information from and to the system on an electronic screen. These devices also act as output units in displaying information from the computer. Other types of input devices are the digitizer which can accept information in a graphical form, graphic terminals, hard copy terminals and telephone terminals. The output devices normally are line printers, plotters and videos. One should distinguish between input devices, output devices and interactive devices which permit flow of information from and to the computer graphically or otherwise. Memory and auxiliary storages normally are in the form of electronic tapes or magnetic tapes like disk, tape, drum and cassettes. Any modern computing environment, whether it be a large system or a micro system contains basically these four modules in different degrees of sizes and sophistication. A typical modern computing environment is shown in figure-3. In India, computer technology has picked up mainly with the arrival of the 8 bit and 16 bit processors. Number of mini and microcomputers are available from Rs. 25000/- to around 50 lakhs. But on the peripheral side, we are yet to manufacture indigenously graphic and other sophisticated terminals eventhough, disk drives, tape drives and card readers are available indigenously. Floppy disks are the most popular means of storage of information and they permit portability also. Networking and teleprocessing have also come into prominence in India, and so even with a small computer, one can access a larger system through network. This feature will considerably help in processing problems both at the local and global levels in future.

a) Lower End



b) Higher End

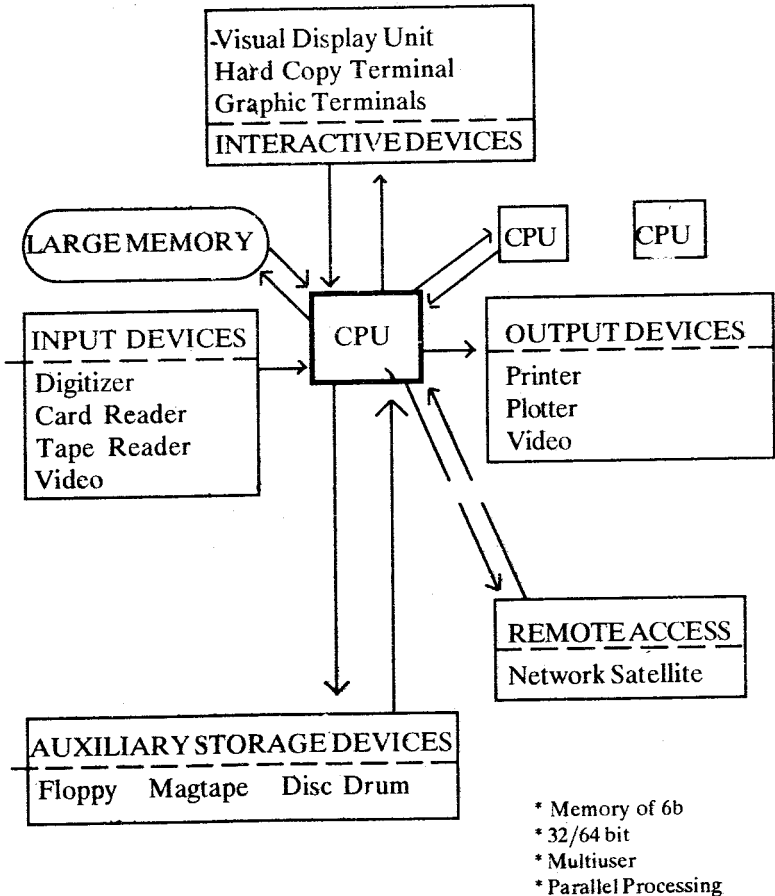


FIG. 3 MODERN COMPUTER ENVIRONMENT

5. Communication to the Computer

The four basic functional elements of the computer, mentioned in the previous section have to be accessed, coordinated and put to use individually and in a combined fashion through a set of instructions. But it is very obvious that the basic language of a computer is the passage and absence of the current through any of the component. This level known as binary-0-1 language is cumbersome and at the same time voluminous to be put to use for manipulating the computer. This led to development of different languages at different levels. These levels are shown in figure-4. Since the normal language used by the human beings and its syntax are very much more sophisticated as compared to the basic understanding power of a computer, languages have to be developed in different levels. Starting from machine language (01 language), assembler language, higher level language like BASIC, FORTRAN etc., were to be developed to serve as via media with the normal human language. These are known as software and this occupies nearly 80-90% of the cost of modern computing system since the hardware components have come down considerably low in price. Compilers, linkers and interpreters are mostly generated to overcome this language barrier. Even operating system which controls the various components of the computer is now-a days being attempted in normal English. One can hope that this gap which exists between the normal human being and that of the computer in communication will be effectively closed with the development of firmware.

6. Application and Appreciation

Having discussed the various developments in the computer technology both in hardware and software it is apt to discuss the developments in applications mainly because of these. Some of the areas which have undergone significant changes because of adaptation with computers are:

- * Information storage and Retrieval
- * Payroll
- * Library Science
- * Banking
- * Products Handling
- * Analysis of Systems

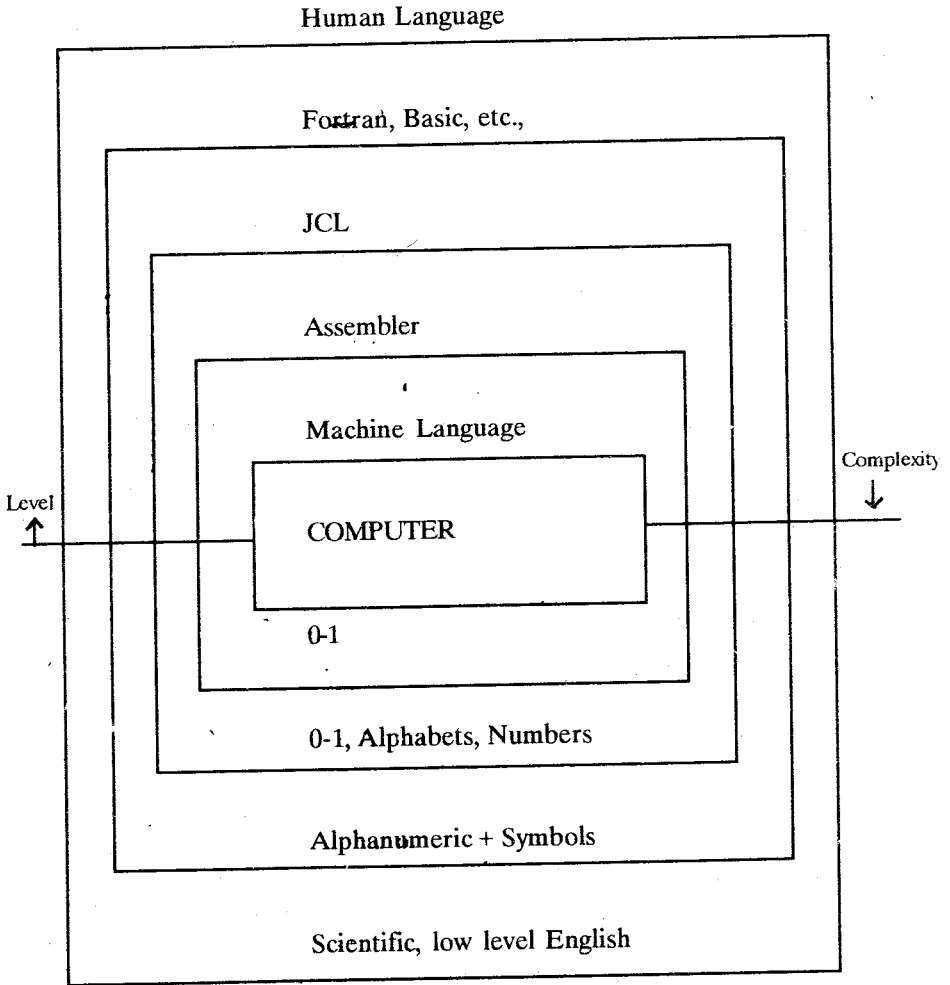


FIG. 4 SOFTWARE FOR COMPUTERS

- * Manufacture
- * Education
- * Management
- * Reservation air, rail etc.,

New concepts like system engineering, data structure, structured programmes and cybernetics have emerged.

All the above areas with particular reference to different applications like civil, mechanical and electrical engineering or sciences like physics, chemistry, medicine and environment, have reached a stage when the computers have become a necessity for any future development in these areas. Even though, computer security and piracy are still some of the basic problems in computer technology, transactions both in business and industry to monitor, control, store and process through computers are very much in vogue so that at any event of time the entire status of the project is literally at the finger tips of the manager of the industry. This feature alone has considerably helped in arriving at better means of running industry, conducting the business and planning a future commitment. This volume has been prepared to generate sufficient amount of interest, so that computers can be appreciated as well as applied to any practical problem in academic library environment.

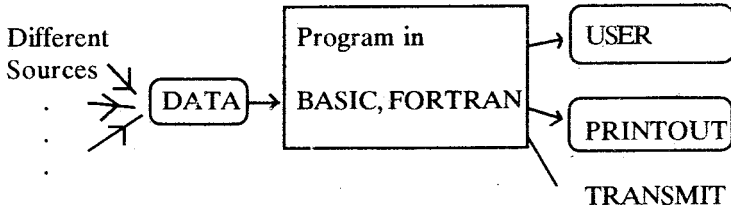
7. Use in Libraries.

Library service and information processing are areas in which computer utilisation can be of a significant nature if software exists. Since computer hardware can be to any level of sophistication and price, data acquisition and storage can be at local level or global level, for centralised processing. Once the data is stored, it is essential to generate information regarding classification of subjects, authors or even chronological acquisition, and for this purpose software is needed. This can be in three different levels:

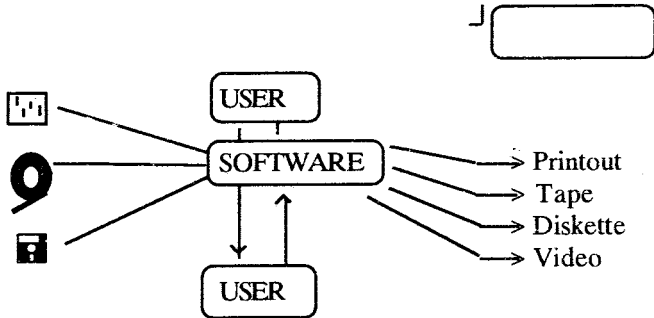
- * Independent program development
- * Use of existing software
- * On-line interaction

Programme development using FORTRAN or BASIC or any other language, specific for analysing and interpreting data has limited usage as it addresses to a particular requirement. But it is powerful

a) Independent Program



b) Existing Software



c) On-line Interaction

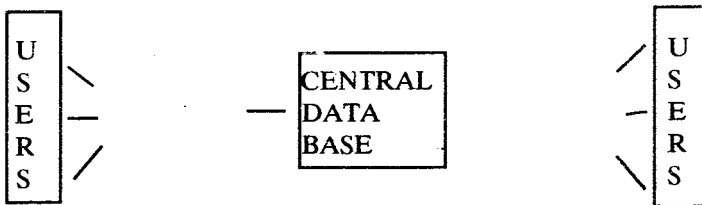


FIG. 5 COMPUTERS IN LIBRARY INFORMATION PROCESSING

in solving local problems. Use of existing software to sort library information has been in vogue since the introduction of mainframe system in computers. Here a well coded software is housed in the heart of a system having large memory. Data through magtapes are loaded and processed to any specific requirement. On-line interaction permits interaction with an international data base using networked computers. National Aeronautical Library (NAL), Bangalore has the facility to access data through the satellite facility from the data base at Paris. These are illustrated in the following figures. Here also a software exists at the main system to answer queries.

A preliminary idea of computer and its application to library service and information processing is given here with the objective of generating interest in usage of computers in libraries and development of library softwares.

REFERENCE.

1. Davis, G. *Information to Computers*, New York, Mc Graw Hill, 1977.
2. Kimpler, RT. *Automation in Libraries*. Oxford: Pergmon, 1974.