INTRODUCTION TO INFORMATION TECHNOLGOY

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Our development from hunter-gatherers to an agricultural based society to an industrial society was agonizingly slow and took thousands of years. The industrial revolution began in England in 1760 during the Victorian age, and England became the world's leading industrial power in less than one hundred years and soon ruled many countries of the world. As a result of the industrial revolution, we were able to build enormous structures like the Eiffel Tower (1887). Industrial age gave us an easier life by allowing us to make tools and fertilizers needed for agriculture, locomotives for travel, and mills for clothing. The main impediments to maximizing productivity were mathematical inaccuracies and the sluggish information flow.

Ballistic calculations requirements arising out of the World War II added great impetus to invention of digital computers. The invention of the transistor and its widespread application in the 1950s brought about commercial quality second generation of computers. The aerospace industry gave us the integrated circuits and faster and smaller computers. Networking these powerful computers together gave us the capabilities of fast information flow. We are well on our way to overcome the aforementioned two deficiencies. We are now in the information age. The investment in information technology has already brought us in the United States a productivity rate that almost doubled.

Information Technology

Information technology is a maturing discipline dealing with the application of all the hardware and software technologies required for processing, analysis, storage, retrieval, visualization, and transmission of information in the form of text, graphics or sound in a reliable and secure environment. The hardware part of information technology deals with installation, configuration, administration and maintenance of servers, clients, routers, switches, interfaces, storage devices, and peripherals. The software part includes the use of system, application, web, and communication programs as well as language editors, compilers and interpreters. The discipline of information technology evolved out of the boom in the high-tech industry in the 1990s. The electrical engineering, computer science and computer information systems graduates could not satisfy the personnel demands of this tremendous growth nor could they integrate all the developments in hardware, software, and web technologies in a satisfactory manner. Information Technology integrates certain aspects of all these disciplines and applies to information handling. In many colleges and universities IT is first offered as a graduate degree and eventually developing the undergraduate program. A graduate program in IT may accept students with a degree from any field and provide them with a curriculum enabling them to be highly productive in the information technology field.

The maturing of web technologies and networking has taken place within a short ten years span. Networking and web have become part of our lives and integral part of our economy. An opinion paper by the Economist affirms that Information Technology is transforming the way the America does business. [The Economist June 22, 2001]. Mr. Alan Greenspan, chairman of the Federal Reserve Board, Alan Greenspan attributes the increase in industrial productivity in the United States [Remarks by Chairman Alan Greenspan, At the Haas Annual Business Faculty Research Dialogue, University of California, Berkeley, California, September 4, 1998] to advances in information technology.

The evolvement of The Information Technology

Traditional categorization of computers into super, mainframe, mini, and micro is no longer as clear cut as once was. This classification was based on cost, computational power and number of simultaneous users allowed. An Intel Pentium CPU of today is more powerful than a supercomputer of a decade ago. Today, it does not make sense to timeshare one computer using dumb terminals when a whole computer with powerful CPU is less expensive than a terminal. A more fitting categorization of today's computers would be personal digital assistants, laptops, desktop personal computers, workstations, servers, tightly coupled computer clusters, and distributed computer clusters. In addition there is an ever-growing category of computers called the embedded processors that find their way into automobiles to refrigerators.

The early computers (1945-1955) used vacuum tubes and magnetic core for memory. These computers are generally classified as First Generation. The transistor was discovered in 1947 and solid state devices using these transistors began to emerge in the mid 1950s. Computers using transistors were classified as Second Generation (1954-1965). The real speed up and wide spread use of computers began with the Third Generation (1965-1980), marked by the Integrated Circuits (IC) and Large Scale Integrated Circuits (LSI). The Fourth Generation (1980 - Now) is hallmarked by the Very Large Scale Integrated Circuits (VLSI). The VLSI made it possible to make computers so small to fit on a desktop or even on a palmtop.

The Mainframe computers had one to several CPUs and could support hundreds of users using dumb terminals. IBM cornered the market with its System/360, so named because of a circle has 360 degrees. Mainframes were out of the reach of most small to medium sized businesses. In 1967, the Digital Equipment Corporation pioneered the PDP-8 that led to a new category of computers called the Minis, marketing to this target group becoming the second largest computer company in the world. A mini could accommodate up to two hundred simultaneous users and costs only tens of thousands of dollars and did not require special air-conditioned rooms. By the 1970s minicomputers became very popular and several other manufacturers such as Data General, Hewlett-Packard, Prime and Wang, entered the market. The last of the PDP series was the PDP-11 and the Digital Equipment Corporation was bought out by Compaq a microcomputer company that was subsequently bought out by Hewlett Packard. IBM entered the minicomputer market rather late with their now famous AS/400 system.

The mainframe computers did not have the computing power required to do modeling and simulation for weather forecasting, automobile simulation, and physical simulations such as wind tunnels. Seymour Cray is the pioneer in supercomputing research and development. The first supercomputer marketed by the Cray Research in 1976 was the Cray-1. The latest (2003) of the Cray series is the Cray X1 supercomputer having processors varying from 4 to 60. There will be demand for tightly coupled parallel processors using multithreading such as the current Cray series for the most demanding tasks requiring high bandwidth and low latency.

Information, Messages, and signals

Data consists of collection of raw facts from which conclusions can be drawn. For example a set of numbers ranging from 40 to 98 may represent data from test results in this class or temperature readings in South Texas. Once analyzed we can draw conclusions such as low and high temp, median temp, average temp, hot day or cool day, etc. These conclusions give information to make decisions. When data or information is transmitted it is called a message and the method of transmission uses signals. For electronic transmissions we use light or electrical pulses. The signals are sent on some sort of medium such as wire, or air. A message must have a sender and a receiver. When a receiver receives the message that was sent by the sender (or its closest approximation) we say that communication has taken place.

Data storage is one of the greatest accomplishments of mankind. We learned how to store grain and goods early on. But did not quite master data storage until writing instruments and writing media were discovered. Most historians believe that one of the first civilizations sprang up in Ur of Mesopotamia, now part of Iraq in Asian continent. Sumerians scribes kept records in cuneiform writing on clay tablets. Many legends and myths of Sumerians appear in a poem known as the Epic of Gilgamesh, possibly one of the earliest literatures known today. Papyrus (the precursor to paper) and leather had been used for many centuries. None of these could store sounds, until the phonograph was invented by Edison in 1877. He learned that sound is vibrations of air hitting our eardrums. He was able to reproduce it by recording the vibrations of a diaphragm as human voice hits the air. He used tinfoil and needle to record the vibrations. When the needle was made to pass over the recorded tinfoil the original vibrations were reproduced on the diaphragm and sound was heard.

Today we use a transducer to produce input signals. These signals are then either stored or transmitted. The signals then can be transmitted over a medium (channel) and sent to an output transducer. During this process, analog signals (speech or music) may be converted to digital signals for storage and transmission and converted back to analog for human hearing. The plain old telephone (POT) transmitted analog signals such as voice without converting it to digital. Transmitting computer generated digital data over the POT was quite challenging. The binary signals had to be modulated one end and demodulated at the other end. This was accomplished by the use of a modem. However, the newer digital telephones first coverts the analog voice to digitized binary signals then

transmitted in the form of light pulses or electric signals. At the receiving end the reverse happens.

Images need to be stored as well. In 1826 a French physicist, coated a pewter sheet with an asphalt solution, put it in an artist's camera obscura, and set it on a windowsill for eight hours. Photography is a process of recording images by capturing light emitted by objects of interest on a light-sensitive medium or electronic sensor. Film captures analog signals. Digital photography digitizes the images then stores the digitized data in binary.

Information Technology in Action

The information technology has become an integral part of many aspects of our lives today. Information technology is integrated into home, all areas of the sciences, art, medicine, education, engineering, banking, broadcasting and agriculture. The computers for home use have sophisticated features and programs once only available on expensive computers. The office suite program that can be purchased bundled with a personal computer has highly sophisticated word processing, database, time-management and email programs. These programs do interact with each other; a file produced in one can be used in another. For example a database program can create and manipulate a customer address file, inventory list, invoices, etc. and a word processing program can use this address file to send personalized letters to each address in that file. PCs have the capabilities for handling image, sound, videoconferencing, simulation and modeling. PCs have made digital photography easy; pictures can be stored on CDs or DVDs and printed with inexpensive color printers.

The information technology is heavily used in research and instruction of the sciences. A relatively new discipline, the Computational Science, involves using computers to study scientific problems through mathematical modeling and simulation. Computational science with the use of high performance computer clusters provides answers to atomic level or gene level problems that were difficult to solve in the past. The scientific research in the field of nanotechnology, which treats material in atomic or molecular level, makes use of computational sciences heavily to bring about innovations in material sciences. .

Sciences.. talk about computational science, chromosome mapping, etc.

Art.. music, painting, etc.

Medicine .. medical informatics,

Education

Engineering

Banking

Broadcasting

Agriculture