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Prepared & Scrutinised by:
Dr. N. PADMANABHAN
Associate Professor
P.G. Department of History
C.A.S. College, Madayi
P.O. Payangadi-RS-670358
Dt. Kannur-Kerala.

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UNIT-I

OVERVIEW OF INFORMATION TECHNOLOGY

How Technology Shapes Our Society

If you think back 10 or 20 years ago, you may wonder how we ever did some of the things we are able to now. Technology shapes our society in a number of different ways. Before the invention of the internet, there wasn't email. Many people in the business world communicate solely with email and without it, they are lost. Have you ever lost your internet connection or networking device? You are literally stuck in a mess and have no idea what to do. Think back the first cell phones that were available, before the days of text massaging and blue tooth. Technology is essential in our society in order to grow and move towards the future. We have the ability to shape the world we live in. The inventions we create allow us to transform our environment, explore the stars, connect societies across the world, and even extend our life span. The invention of the computer has brought economic and social change to the world. So what does the future of technology hold for our society? The possibilities are literally endless. Some of the key factors the government is working on surround information technology.

With all the new innovations in technology, some people learn how to corrupt and abuse it. Protecting our individual privacy has become so important due to overwhelming cases of fraud and identity theft. The internet allows us to input personal information online for practically anyone to see. Social networking sites have become so popular that undercover policemen have stepped in to protect people from rapists, murders, and pedophiles. There are tools and practices that exist to allow individuals control over their personal information, but it is not enough. Web site hacking goes along with individual privacy, but it impacts the future of several businesses. Government leaders are looking for ways to create a safe, secure and reliable computing environment for businesses and individuals. Protecting our children from inappropriate content is another popular topic among several businesses and government agencies. While the personal computer and the internet have revolutionized education, they have also opened the doors for exploration by curious children.
Technology has allowed countries across the world to connect and interact without having to fly thousands of miles to communicate with each other. Governments and industries are able to communicate and work together towards the future. This allows successful countries to communicate with other countries that lack essential resources and help them find ways to combat their challenges. Digital information can be sent with the click of a button. Software, books, music and video files can be easily distributed to anyone, anywhere. For users, this is beneficial because for no cost, they can share videos of their new baby being born to their family who lives across the country. Of course, the government has had to step in to protect property rights of individuals to ensure that nothing is being digitally stolen.

We should look at technology at the gateway to the future. The possibilities of what we can create are endless. Even as we have challenges with technology, we are still able to see amazing things come from it. Technology plays a critical role in our society. Creating technology that is secure and trustworthy is the future. Several companies are working together to achieve this goal and to help our society move forward. Technologies arise to satisfy our wants and needs, this is how society and technology shape the future for one another. As individuals, we are in control of the future. We should dream big and start finding ways to make our dreams into reality.

Technology and society

Technology and society or technology and culture refer to cyclical co-dependence, co-influence, co-production of technology and society upon the other (technology upon culture, and vice-versa). This synergistic relationship occurred from the dawn of humankind, with the invention of simple tools and continues into modern technologies such as the printing press and computers. The academic discipline studying the impacts of science, technology, and society and vice versa is called (and can be found at) Science and technology studies.

1. Pre-historical

The importance of stone tools, circa 2.5 million years ago, is considered fundamental in human development in the hypothesis. It has been suggested, in Catching Fire: How Cooking Made Us Human, that the control of fire by early humans and the associated development of cooking was the spark that radically changed human evolution. All these little changes in mobile phones, like Internet access, are further examples of the cycle of co-production. Society’s need for being able to call on people and be available everywhere resulted in the research
and development of mobile phones. They in turn influenced the way we live our lives. As the populace relies more and more on mobile phones, additional features were requested. This is also true with today’s modern media player.

Society also influenced changes to previous generation media players. In the first personal music players, cassettes stored music. However, that method seemed fragile and relatively low fidelity when compact disks came along. Later, availability of MP3 and other compact file formats made compact disks seem too large and limited, so manufacturers created MP3 players which are small and hold large amount of data. Societal preferences helped determine the course of events through predictable preferences.

2. Economics and technological development

In ancient history, economics began when occasional, spontaneous exchange of goods and services was replaced over time by deliberate trade structures. Makers of arrowheads, for example, might have realized they could do better by concentrating on making arrowheads and barter for other needs. Clearly, regardless of goods and services bartered, some amount of technology was involved—if no more than in the making of shell and bead jewelry. Even the shaman’s potions and sacred objects can be said to have involved some technology. So, from the very beginnings, technology can be said to have spurred the development of more elaborate economies.

In the modern world, superior technologies, resources, geography, and history give rise to robust economies; and in a well-functioning, robust economy, economic excess naturally flows into greater use of technology. Moreover, because technology is such an inseparable part of human society, especially in its economic aspects, funding sources for (new) technological endeavors are virtually illimitable. However, while in the beginning, technological investment involved little more than the time, efforts, and skills of one or a few men, today, such investment may involve the collective labor and skills of many millions.

Funding

Consequently, the sources of funding for large technological efforts have dramatically narrowed, since few have ready access to the collective labor of a whole society, or even a large part. It is conventional to divide up funding sources into governmental (involving whole, or nearly whole, social enterprises) and private (involving more limited, but generally more sharply focused) business or individual enterprises.
Government funding for new technology

The government is a major contributor to the development of new technology in many ways. In the United States alone, many government agencies specifically invest billions of dollars in new technology. [In 1980, the UK government invested just over 6-million pounds in a four-year program, later extended to 6 years, called the Microelectronics Education Programme (MEP), which was intended to give every school in Britain at least one computer, software, training materials, and extensive teacher training. Similar programs have been instituted by governments around the world.]

Technology has frequently been driven by the military, with many modern applications developed for the military before they were adapted for civilian use. However, this has always been a two-way flow, with industry often developing and adopting a technology only later adopted by the military. Entire government agencies are specifically dedicated to research, such as America’s National Science Foundation, the United Kingdom’s scientific research institutes, America’s Small Business Innovative Research effort. Many other government agencies dedicate a major portion of their budget to research and development.

Private funding

Research and development is one of the smallest areas of investments made by corporations toward new and innovative technology. Many foundations and other nonprofit organizations contribute to the development of technology. In the OECD, about two-thirds of research and development in scientific and technical fields is carried out by industry, and 98% and 10% respectively by universities and government. But in poorer countries such as Portugal and Mexico the industry contribution is significantly less. The U.S. government spends more than other countries on military research and development, although the proportion has fallen from about 30% in the 1980s to less than 10%.

The 2009 founding of Kickstarter allows individuals to receive funding via crowd sourcing for many technology related products including new physical creations as well as documentaries, films, and web series that focus on technology management. This circumvents the corporate or government oversight most inventors and artists struggle against but leaves the accountability of the project completely with the individual receiving the funds.

Technology and Economics in the Future

Some analysts such as Martin Ford, author of ‘The Lights in the Tunnel: Automation, Accelerating Technology and the Economy of the Future’, argue that as information technology advances, robots and other forms of automation will
ultimately result in significant unemployment as machines and software begin to match and exceed the capability of workers to perform most routine jobs.

As robotics and artificial intelligence develop further, even many skilled jobs may be threatened. Technologies such as machine learning may ultimately allow computers to do many knowledge-based jobs that require significant education. This may result in substantial unemployment at all skill levels, stagnant or falling wages for most workers, and increased concentration of income and wealth as the owners of capital capture an ever larger fraction of the economy. This in turn could lead to depressed consumer spending and economic growth as the bulk of the population lacks sufficient discretionary income to purchase the products and services produced by the economy.

Other economic considerations

- Appropriate technology, sometimes called "intermediate" technology, more of an economics concern, refers to compromises between central and expensive technologies of developed nations and those that developing nations find most effective to deploy given an excess of labour and scarcity of cash.

- Persuasion technology: In economics, definitions or assumptions of progress or growth are often related to one or more assumptions about technology’s economic influence. Challenging prevailing assumptions about technology and its usefulness has led to alternative ideas like uneconomic growth or measuring well-being. These, and economics itself, can often be described as technologies, specifically, as persuasion technology.

3. Sociological factors and effects

Values

The implementation of technology influences the values of a society by changing expectations and realities. The implementation of technology is also influenced by values. There are (at least) three major, interrelated values that inform, and are informed by, technological innovations:

- **Mechanistic world view:** Viewing the universe as a collection of parts, (like a machine), that can be individually analyzed and understood. This is a form of reductionism that is rare nowadays. However, the "neo-mechanistic world view" holds that nothing in the universe cannot be understood by the human intellect. Also, while all things are greater than the sum of their parts (e.g., even if we consider nothing more than the information involved in their combination), in principle, even this excess
must eventually be understood by human intelligence. That is, no divine or vital principle or essence is involved.

- **Efficiency:** A value, originally applied only to machines, but now applied to all aspects of society, so that each element is expected to attain a higher and higher percentage of its maximal possible performance, output, or ability.

- **Social progress:** The belief that there is such a thing as social progress, and that, in the main, it is beneficent. Before the Industrial Revolution, and the subsequent explosion of technology, almost all societies believed in a cyclical theory of social movement and, indeed, of all history and the universe. This was, obviously, based on the cyclicity of the seasons, and an agricultural economy’s and society’s strong ties to that cyclicity. Since much of the world is closer to their agricultural roots, they are still much more amenable to cyclicity than progress in history. This may be seen, for example, in Prabhat rainjan sarkar’s modern social cycle’s theory.

**Institutions and groups**

Technology often enables organizational and bureaucratic group structures that otherwise and heretofore were simply not possible. Examples of this might include:

- The rise of very large organizations: e.g., governments, the military, health and social welfare institutions, supranational corporations.
- The commercialization of leisure: sports events, products, etc.
- The almost instantaneous dispersal of information (especially news) and entertainment around the world.

**International**

Technology enables greater knowledge of international issues, values, and cultures. Due mostly to mass transportation and mass media, the world seems to be a much smaller place, due to the following, among others:

- Globalization of ideas
- Embeddedness of values
- Population growth and control
- Others

**4. Environment**

Technology provides an understanding, and an appreciation for the world around us. Most modern technological processes produce unwanted byproducts in addition to the desired products, which are known as industrial
waste and pollution. While most material waste is re-used in the industrial process, many forms are released into the environment, with negative environmental side effects, such as pollution and lack of sustainability. Different social and political systems establish different balances between the value they place on additional goods versus the disvalues of waste products and pollution. Some technologies are designed specifically with the environment in mind, but most are designed first for economic or ergonomic effects. Historically, the value of a clean environment and more efficient productive processes has been the result of an increase in the wealth of society, because once people are able to provide for their basic needs, they are able to focus on less-tangible goods such as clean air and water.

The effects of technology on the environment are both obvious and subtle. The more obvious effects include the depletion of nonrenewable natural resources (such as petroleum, coal, ores), and the added pollution of air, water, and land. The more subtle effects include debates over long-term effects (e.g., global warming, deforestation, natural habitat destruction, coastal wetland loss). Each wave of technology creates a set of waste previously unknown by humans: toxic waste, radioactive waste, electronic waste.

One of the main problems is the lack of an effective way to remove these pollutants on a large scale expediently. In nature, organisms "recycle" the wastes of other organisms, for example, plants produce oxygen as a by-product of photosynthesis, and oxygen-breathing organisms use oxygen to metabolize food, producing carbon dioxide as a by-product, which plants use in a process to make sugar, with oxygen as a waste in the first place. No such mechanism exists for the removal of technological wastes. Humanity at the moment may be compared to a colony of bacteria in a Petri dish with a constant food supply: with no way to remove the wastes of their metabolism, the bacteria eventually poison themselves.

5. Construction and shaping

Choice

Society also controls technology through the choices it makes. These choices not only include consumer demands; they also include:

- the channels of distribution, how do products go from raw materials to consumption to disposal;
- the cultural beliefs regarding style, freedom of choice, consumerism, materialism, etc.;
- the economic values we place on the environment, individual wealth, government control, capitalism, etc.
According to Williams and Edge, the construction and shaping of technology includes the concept of choice (and not necessarily conscious choice). Choice is inherent in both the design of individual artifacts and systems, and in the making of those artifacts and systems. The idea here is that a single technology may not emerge from the unfolding of a pre-determined logic or a single determinant; technology could be a garden of forking paths, with different paths potentially leading to different technological outcomes. This is a position that has been developed in detail by Judy Wajcman Therefore; choices could have differing implications for society and for particular social groups.

**Autonomous technology**

In one line of thought, technology develops autonomously, in other words, technology seems to feed on itself, moving forward with a force irresistible by humans. To these individuals; technology is "inherently dynamic and self-augmenting." Jacques Ellul is one proponent of the irresistibleness of technology to humans. He espouses the idea that humanity cannot resist the temptation of expanding our knowledge and our technological abilities. However, he does not believe that this seeming autonomy of technology is inherent. But the perceived autonomy is because humans do not adequately consider the responsibility that is inherent in technological processes. Another proponent of these ideas is Langdon Winner who believes that technological evolution is essentially beyond the control of individuals or society.

**Government**

Individuals rely on governmental assistance to control the side effects and negative consequences of technology.

- Supposed independence of government. An assumption commonly made about the government is that their governance role is neutral or independent. However some argue that governing is a political process, so government will be influenced by political winds of influence. In addition, because government provides much of the funding for technological research and development, it has a vested interest in certain outcomes. Other point out that the world's biggest ecological disasters, such as the Aral Sea, Chernobyl, and Lake Karachay have been caused by government projects, which are not accountable to consumers.

- Liability. One means for controlling technology is to place responsibility for the harm with the agent causing the harm. Government can allow more or less legal liability to fall to the organizations or individuals responsible for damages.
Legislation. A source of controversy is the role of industry versus that of government in maintaining a clean environment. While it is generally agreed that industry needs to be held responsible when pollution harms other people, there is disagreement over whether this should be prevented by legislation or civil courts, and whether ecological systems as such should be protected from harm by governments.

Recently, the social shaping of technology has had new influence in the fields of e-science and e-social science in the United Kingdom, which has made centers focusing on the social shaping of science and technology a central part of their funding programs.

History of technology

From print culture to information technology

The wheel was invented in the 4th millennium BC, and has become one of the worlds most famous and most useful technologies. This wheel is on display in The National Museum of Iran, in Tehran. The history of technology is the history of the invention of tools and techniques, and is similar in many ways to the history of humanity. Background knowledge has enabled people to create new things, and conversely, many scientific endeavors have become possible through technologies which assist humans to travel to places we could not otherwise go, and probe the nature of the universe in more detail than our natural senses allow.

Technological artifacts are products of an economy, a force for economic growth, and a large part of everyday life. Technological innovations affect, and are affected by, a society's cultural traditions. They also are a means to develop and project military power.

Measuring technological progress

Many sociologists and anthropologists have created social theories dealing with social and cultural evolution. Some, like Lewis H. Morgan, Leslie White, and Gerhard Lenski, declare technological progress to be the primary factor driving the development of human civilization. Morgan's concept of three major stages of social evolution (savagery, barbarism, and civilization) can be divided by technological milestones, such as fire, the bow, and pottery in the savage era, domestication of animals, agriculture, and metalworking in the barbarian era and the alphabet and writing in the civilization era.

Instead of specific inventions, White decided that the measure by which to judge the evolution of culture was energy. For White "the primary functions of culture" is to "harness and control energy". White differentiates between five
stages of human development: In the first, people use energy of their own muscles. In the second, they use energy of domesticated animals’. In the third; they use the energy of plants (agricultural revolution). In the fourth, they learn to use the energy of natural resources: coal, oil, gas. In the fifth, they harness nuclear energy. White introduced a formula P=E*T, where E is a measure of energy consumed, and T is the measure of efficiency of technical factors utilizing the energy. In his own words, "culture evolves as the amount of energy harnessed per capita per year is increased or as the efficiency of the instrumental means of putting the energy to work is increased". Russian astronomer, Nikolai Kardashev, extrapolated his theory creating the Kardashev scale, which categorizes the energy use of advanced civilizations.

Lenski takes a more modern approach and focuses on information. The more information and knowledge (especially allowing the shaping of natural environment) a given society has, the more advanced it is. He identifies four stages of human development, based on advances in the history of communication. In the first stage, information is passed by genes. In the second, when humans gain sentience, they can learn and pass information through by experience. In the third, the humans start using signs and develop logic. In the fourth, they can create symbols, develop language and writing. Advancements in the technology of communication translates into advancements in the economic system and political system, distribution of wealth, social inequality and other spheres of social life. He also differentiates societies based on their level of technology, communication and economy:

- hunters and gatherers,
- simple agricultural,
- advanced agricultural,
- industrial,
- Special (such as fishing societies).

Finally, from the late 1970s sociologists and anthropologists like Alvin Toffler, Daniel Bell and John Naisbitt have approached the theories of post-industrial societies, arguing that the current era of industrial society is coming to an end, and services and information are becoming more important than industry and goods. Some of the more extreme visions of the post-industrial society, especially in fiction, are strikingly similar to the visions of near and post-Singularity societies.
By period and geography

Early technology

Agriculture preceded writing in the history of technology.

- Olduvai stone technology (Olduwan) 2.5 million years ago (scrapers; to butcher dead animals)
- Acheulean stone technology 1.6 million years ago (hand axe)
- Fire creation and manipulation, used since the Paleolithic, possibly by Homo erectus as early as 1.5 Million years ago
- (Homo sapiens sapiens - modern human anatomy arises, around 200,000 years ago.)
- Clothing possibly 170,000 years ago.
- Stone tools, used by Homo floresiensis, possibly 100,000 years ago.
- Ceramics .25,000 BC
- Domestication of Animals, 15,000 BC
- Bow, sling .9th millennium BC
- Microliths. 9th millennium BC
- Copper. 8000 BC
- Agriculture and Plough. 8000 BC
- Wheel. 4000 BC
- Gnomon. 4000 BC
- Writing systems. 3500 BC
- Bronze. 3300 BC
- Salt. 2500 BC
- Chariot. 2000 BC
- Iron. 1500 BC
- Sundial. 800 BC
- Glass. 500 BC
- Catapult. 400 BC
- Horseshoe. 300 BC
- Stirrup first few centuries AD
**Pre-historic technology**

During the Paleolithic Age, all humans had a lifestyle which involved limited use of tools and few permanent settlements. The first major technologies, then, were tied to survival, hunting, and food preparation in this environment. Fire, stone tools and weapons, and clothing were technological developments of major importance during this period. Stone Age cultures developed music, and engaged in organized warfare. A subset of Stone Age humans, including Ngaro Aborigines, developed ocean-worthy outrigger canoe technology, leading to an eastward migration across the Malay archipelago, across the Indian ocean to Madagascar and also across the Pacific Ocean, which required knowledge of the ocean currents, weather patterns, sailing, celestial navigation, and star maps. The early Stone Age is described as Epipaleolithic or Mesolithic. The former is generally used to describe the early Stone Age in areas with limited glacial impact. The later Stone Age, during which the rudiments of agricultural technology were developed, is called the Neolithic period. During this period, polished stone tools were made from a variety of hard rocks such as flint, jade, jadeite and greenstone, largely by working exposures as quarries, but later the valuable rocks were pursued by tunnelling underground, the first steps in mining technology. The polished axes were used for forest clearance and the establishment of crop farming, and were so effective as to remain in use when bronze and iron appeared.

Although Paleolithic cultures left no written records, the shift from nomadic life to settlement and agriculture can be inferred from a range of archaeological evidence. Such evidence includes ancient tools, cave paintings, and other prehistoric art, such as the Venus of Willendorf. Human remains also provide direct evidence, both through the examination of bones, and the study of mummies. Though concrete evidence is limited, scientists and historians have been able to form significant inferences about the lifestyle and culture of various prehistoric peoples, and the role technology played in their lives.

**Technology during the Copper and Bronze Ages**

The Stone Age developed into the Bronze Age after the Neolithic Revolution. The Neolithic Revolution involved radical changes in agricultural technology which included development of agriculture, animal domestication, and the adoption of permanent settlements. These combined factors made possible the development of metal smelting, with copper and later bronze, an alloy of tin and copper, being the materials of choice, although polished stone
tools continued to be used for a considerable time owing to their abundance compared with the less common metals (especially tin).

This technological trend apparently began in the Fertile Crescent, and spread outward over time. These developments were not, and still are not, universal. The Three-age system does not accurately describe the technology history of groups outside of Eurasia, and does not apply at all in the case of some isolated populations, such as the Spinifex People, the Sentinelese, and various Amazonian tribes, which still make use of Stone Age technology, and have not developed agricultural or metal technology.

**Iron Age technology**

The Iron Age involved the adoption of iron smelting technology. It generally replaced bronze, and made it possible to produce tools which were stronger and cheaper to make than bronze equivalents. In many Eurasian cultures, the Iron Age was the last major step before the development of written language, though again this was not universally the case. It was not possible to mass manufacture steel because high furnace temperatures were needed, but steel could be produced by forging bloomery iron to reduce the carbon content in a controllable way. Iron ores were much more widespread than either copper or tin. In Europe, large hill forts were built either as a refuge in time of war, or sometimes as permanent settlements. In some cases, existing forts from the Bronze Age were expanded and enlarged. The pace of land clearance using the more effective iron axes increased, providing more farmland to support the growing population.

**Ancient technology**

It was the growth of the ancient civilizations which produced the greatest advances in technology and engineering, advances which stimulated other societies to adopt new ways of living and governance. The Egyptians invented and used many simple machines, such as the ramp to aid construction processes. The Indus Valley Civilization, situated in a resource-rich area, is notable for its early application of city planning and sanitation technologies. Ancient India was also at the forefront of seafaring technology—a panel found at Mohenjodaro, depicts a sailing craft. Indian construction and architecture, called 'Vaastu Shastra', suggests a thorough understanding of materials engineering, hydrology, and sanitation.

The Chinese were responsible for numerous technology discoveries and developments. Major technological contributions from China include early seismological detectors, matches, paper, cast iron, the iron plough, the multi-tube seed drill, the suspension bridge, the parachute natural gas as fuel, the magnetic compass, the raised-relief map, the propeller, the crossbow, the South
Pointing Chariot, and gun powder. Greek and Hellenistic engineers invented many technologies and improved upon pre-existing technologies. Particularly the Hellenistic period saw a sharp rise in technological inventiveness, fostered by a climate of openness to new ideas, royal patronage, the blossoming of a mechanistic philosophy, and the establishment of the Library of Alexandria and its close association with the adjacent museion. In contrast to the typically anonymous inventor of earlier ages, ingenious minds such as Archimedes, Philo of Byzantium, Heron, Ctesibius, and Archytas now remained known by name to posterity.

Ancient Greek innovations were particularly pronounced in mechanical technology, including the ground-breaking invention of the watermill which constituted the first human-devised motive force not to rely on muscle labour (besides the sail). Apart from their pioneer use of waterpower, Greek inventors were also the first to experiment with wind power and even created the earliest steam engine (the aeolipile), opening up entirely new possibilities in harnessing natural forces whose full potential came only to be exploited in the industrial revolution. Of particular importance for the operation of mechanical devices became the newly devised right-angled gear and the screw.

Ancient agriculture, as in any period prior to the modern age the primary mode of production and subsistence, and its irrigation methods were considerably advanced by the invention and widespread application of a number of previously unknown water-lifting devices, such as the vertical water-wheel, the compartmented wheel, the water turbine, Archimedes screw, the bucket-chain and pot-garland, the force pump, the suction pump, the double-action piston pump and quite possibly the chain pump. In music, water organ, invented by Ctesibius and subsequently improved, constituted the earliest instance of a keyboard instrument. In time-keeping, the introduction of the inflow clepsydra and its mechanization by the dial and pointer, the application of a feedback system and the escapement mechanism far superseded the earlier outflow clepsydra.

The famous Antikythera mechanism, a kind of analogous computer working with a differential gear, and the astrolabe show great refinement in the astronomical science. Greek engineers were also the first to devise automaton such as vending machines, suspended ink pots, automatic washstands and doors, primarily as toys, which however featured many new useful mechanisms such as the cam and gimbals. In other fields, ancient Greek inventions include the catapult and the gastraphetes crossbow in warfare, hollow bronze-casting in metallurgy, the dioptra for surveying, in infrastructure the lighthouse, central heating, the tunnel excavated from both ends by scientific calculations, the ship...
trackway, the dry dock and plumbing. In horizontal vertical and transport great progress resulted from the invention of the crane, the winch, the wheelbarrow and the odometer. Further newly created techniques and items were spiral staircases, the chain drive, sliding calipers and showers.

The Romans developed an intensive and sophisticated agriculture, expanded upon existing iron working technology, created laws providing for individual ownership, advanced stone masonry technology, advanced road-building (exceeded only in the 19th century), military engineering, civil engineering, spinning and weaving and several different machines like the Gallic reaper that helped to increase productivity in many sectors of the Roman economy. Roman engineers were the first to build monumental arches, amphitheatres, aqueducts, public baths, true arch bridges, harbours, reservoirs and dams, vaults and domes on a very large scale across their Empire. Notable Roman inventions include the book (Codex), glass blowing and concrete. Because Rome was located on a volcanic peninsula, with sand which contained suitable crystalline grains, the concrete which the Romans formulated was especially durable. Some of their buildings have lasted 2000 years, to the present day.

The engineering skills of the Inca and the Mayans were great, even by today's standards. An example is the use of pieces weighing in upwards of one ton in their stonework placed together so that not even a blade can fit in-between the cracks. The villages used irrigation canals and drainage systems, making agriculture very efficient. While some claim that the Incas were the first inventors of hydroponics, their agricultural technology was still soil based, if advanced. Though the Maya civilization had no metallurgy or wheel technology, they developed complex writing and astrological systems, and created sculptural works in stone and flint. Like the Inca, the Maya also had command of fairly advanced agricultural and construction technology. Throughout this time period much of this construction, was made only by women, as men of the Maya civilization believed that females were responsible for the creation of new things. The main contribution of the Aztec rule was a system of communications between the conquered cities. In Mesoamerica, without draft animals for transport (nor, as a result, wheeled vehicles), the roads were designed for travel on foot, just like the Inca and Mayan civilizations.

**Medieval and modern technologies**

**Medieval Europe**

European technology in the Middle Ages may be best described as a symbiosis of *traditio et innovatio*. While medieval technology has been long depicted as a step backwards in the evolution of Western technology, sometimes
willfully so by modern authors intent on denouncing the church as antagonistic to scientific progress, a generation of medievalists around the American historian of science Lynn White stressed from the 1940s onwards the innovative character of many medieval techniques. Genuine medieval contributions include for example mechanical clocks, spectacles and vertical windmills. Medieval ingenuity was also displayed in the invention of seemingly inconspicuous items like the watermark or the functional button. In navigation, the foundation to the subsequent age of exploration was laid by the introduction of pintle-and-gudgeon rudders, llette sails, the dry compass the horseshoe and the astrolabe.

Significant advances were also made in military technology with the development of plate armour, steel crossbows, counterweight trebuchets and cannon. Perhaps best known are the Middle Ages for their architectural heritage: While the invention of the rib vault and pointed arch gave rise to the high rising Gothic style, the ubiquitous medieval fortifications gave the era the almost proverbial title of the 'age of castles'.

**Inexpensive paper: a revolution in the diffusion of knowledge**

Paper making, a 2nd century Chinese technology, was carried to the Middle East when a group of Chinese paper makers were captured in the 8th century. Paper making technology was spread to Mediterranean by the Muslim conquests. A paper mill was established in Sicily in the 12th century. In Europe the fiber to make pulp for making paper was obtained from linen and cotton rags. Lynn White credited the spinning wheel with increasing the supply of rags, which led to cheap paper, which was a factor in the development of printing.

**Renaissance technology**

The era is marked by such profound technical advancements like linear perceptivity, patent law, double shell domes or Bastion fortresses. Note books of the Renaissance artist-engineers such as Taccola and Leonardo da Vinci give a deep insight into the mechanical technology then known and applied. Architects and engineers were inspired by the structures of Ancient Rome, and men like Brunelleschi created the large dome of Florence Cathedral as a result. He was awarded one of the first patents ever issued in order to protect an ingenious crane he designed to raise the large masonry stones to the top of the structure. Military technology developed rapidly with the widespread use of the cross-bow and ever more powerful artillery, as the city-states of Italy were usually in conflict with one another. Powerful families like the Medici were strong patrons of the arts and sciences. Renaissance science spawned the Scientific Revolution; science and technology began a cycle of mutual advancement. The invention of
the moveable type printing press lead to a tremendous increase in the number of books and the number of titles published.

**Age of Exploration**

The sailing ship (Nau or Carrack) enabled the Age of Exploration with the European colonization of the Americas, epitomized by Francis Bacon's New Atlantis. Pioneers like Vasco de Gama, Cabral, Magellan and Christopher Columbus explored the world in search of new trade routes for their goods and contacts with Africa, India and China which shortened the journey compared with traditional routes overland. They also re-discovered the Americas while doing so. They produced new maps and charts which enabled following mariners to explore further with greater confidence. Navigation was generally difficult however owing to the problem of longitude and the absence of accurate chronometers. European powers rediscovered the idea of the civil code, lost since the time of the Ancient Greeks.

**Industrial Revolution**

The British Industrial Revolution is characterized by developments in the areas of textile manufacturing, mining, metallurgy and transport driven by the development of the steam engine. Above all else, the revolution was driven by cheap energy in the form of coal, produced in ever-increasing amounts from the abundant resources of Britain. Coal converted to coke gave the blast furnace and cast iron in much larger amounts than before, and a range of structures could be created, such as The Iron Bridge. Cheap coal meant that industry was no longer constrained by water resources driving the mills, although it continued as a valuable source of power. The steam engine helped drain the mines, so more coal reserves could be accessed, and the output of coal increased. The development of the high-pressure steam engine made locomotives possible, and a transport revolution followed.

**19th century**

The 19th century saw astonishing developments in transportation, construction, and communication technologies originating in Europe, especially in Britain. The Steam Engine which had existed since the early 18th century, was practically applied to both steamboat and railway transportation. The first purpose built railway line opened between Manchester and Liverpool in 1830, the Rocket locomotive of Robert Stephenson being one of the first working locomotives used on the line. Telegraphy also developed into a practical technology in the 19th century to help run the railways safely.

Other technologies were explored for the first time, including the incandescent light bulb. The invention of the incandescent light bulb had a
profound effect on the workplace because factories could now have second and third shift workers. Manufacture of ships’ pulley blocks by all-metal machines at the Portsmouth block mills instigated the age of mass production. Machine tools used by engineers to manufacture parts began in the first decade of the century, notably by Richard Roberts and Joseph Whitworth. The development of interchangeable parts through what is now called the American system of manufacturing which began in the firearms industry at the U.S Federal arsenals in the early 19th century and became widely used by the end of the century.

Steamships were eventually completely iron-clad, and played a role in the opening of Japan and China to trade with the West. The Second Industrial Revolution at the end of the 19th century saw rapid development of chemical, electrical, petroleum, and steel technologies connected with highly structured technology research. The period from last third of the 19th century until First world war is sometimes referred to as the Second Industrial Revolution:

20th century

20th century technology developed rapidly. Communication technology, transportation technology, broad teaching and implementation of scientific method, and increased research spending all contributed to the advancement of modern science and technology. Due to the scientific gains directly tied to military research and development, technologies including electronic computing might have developed as rapidly as they did in part due to war. Radio, radar, and early sound recording were key technologies which paved the way for the telephone, fax machine, and magnetic storage of data. Energy and engine technology improvements were also vast, including nuclear power, developed after the Manhattan project. Transport by rocketry: most work occurred in Germany (Oberth), Russia (Tsiolkovsky) and the US (Goddard). Making use of computers and advanced research labs, modern scientists have recombinant DNA. The US National Academy of Engineering, by expert vote, established the following ranking of the most important technological developments of the 20th century:

1. Electrification
2. Automobile
3. Airplane
4. Water supply and Distribution
5. Electronics
6. Radio and Television
7. Telephone
8. Air Conditioning and Refrigeration
9. Highways
10. Spacecraft
11. Internet
12. Imaging
13. Household appliances
14. Health Technologies
15. Petroleum and Petrochemical Technologies
16. Laser and Fiber Optics
17. Nuclear technologies
18. Materials science

Absent from the above list is the systematic method of mass production which contributed to almost all of the above technologies.

21st century

In the early 21st century, the main technology being developed is electronics. Broadband Internet access became commonplace in developed countries, as did connecting home computers with music libraries and mobile phones. Biotechnology is a relatively new field that holds yet unknown possibilities. Research is ongoing into quantum computers, nanotechnology, bioengineering, nuclear fusion, advanced materials (e.g., graphene), the scramjet (along with railguns and high-energy beams for military uses), superconductivity, the memristor, and green technologies such as alternative fuels (e.g., fuel cells, plugin hybrid cars) and more efficient LEDs and solar cells.

The understanding of particle physics is also expected to expand through particle accelerator projects, such as the Large Hadron Collider – the largest science project in the world and neutrino detectors such as the ANTARES. Theoretical physics currently investigates quantum gravity proposals such as M-theory, superstring theory, and loop quantum gravity. The underlying phenomenon of M-theory, supersymmetry, is hoped to be experimentally confirmed with the International Linear Collider. Dark matter is also in the process of being detected via underground detectors (to prevent noise from cosmic rays). LIGO is trying to detect gravitational waves underground.
Spacecraft designs are also being developed, like the Orion. The James Webb Space Telescope will try to identify early galaxies as well as the exact location of the Solar System within our galaxy, using the infrared spectrum. The finished International Space Station will provide an intermediate platform for space missions and zero gravity experiments. Despite challenges and criticism, NASA and ESA plan a manned mission to Mars in the 2030s.

HISTORY OF COMPUTERS

Reedy (1984) quoted Aldous Huxley thus: “that men do not learn very much from the lessons of history is the most important of all the lessons that history has to teach.” It therefore emphasizes the need to study history of the computer because a proper study and understanding of the evolution of computers will undoubtedly help to greatly improve on computer technologies.

Introduction

The word ‘computer’ is an old word that has changed its meaning several times in the last few centuries. Originating from the Latin, by the mid-17th century it meant ‘someone who computes’. The American Heritage Dictionary (1980) gives its first computer definition as “a person who computes.” The computer remained associated with human activity until about the middle of the 20th century when it became applied to “a programmable electronic device that can store, retrieve, and process data” as Webster’s Dictionary (1980) defines it. Today, the word computer refers to computing devices, whether or not they are electronic, programmable, or capable of ‘storing and retrieving’ data.

The Techencyclopedia (2003) defines computer as “a general purpose machine that processes data according to a set of instructions that are stored internally either temporarily or permanently.” The computer and all equipment attached to it are called hardware. The instructions that tell it what to do are called "software" or “program”. A program is a detailed set of humanly prepared instructions that directs the computer to function in specific ways. Furthermore, the Encyclopedia Britannica (2003) defines computers as “the contribution of major individuals, machines, and ideas to the development of computing.” This implies that the computer is a system. A system is a group of computer components that work together as a unit to perform a common objective.

The term ‘history’ means past events. The encyclopedia Britannica (2003) defines it as “the discipline that studies the chronological record of events (as affecting a nation or people), based on a critical examination of source materials and usually presenting an explanation of their causes.” The Oxford Advanced Learner’s Dictionary (1995) simply defines history as “the study of past events....”
particularly in the area of technological development – will be explained. History of computer in the area of technological development is being considered because it is usually the technological advancement in computers that brings about economic and social advancement. A faster computer brings about faster operation and that in turn causes an economic development. Here we can discuss classes of computers, computer evolution and highlight some roles played by individuals in these developments.

**Classification of Computers**

Computing machines can be classified in many ways and these classifications depend on their functions and definitions. They can be classified by the technology from which they were constructed, the uses to which they are put, their capacity or size, the era in which they were used, their basic operating principle and by the kinds of data they process. Some of these classification techniques are discussed as follows:

**Classification by Technology**

This classification is a historical one and it is based on what performs the computer operation, or the technology behind the computing skill.

I. **FLESH**: Before the advent of any kind of computing device at all, human beings performed computation by themselves. This involved the use of fingers, toes and any other part of the body.

II. **WOOD**: Wood became a computing device when it was first used to design the abacus. Shickard in 1621 and Polini in 1709 were both instrumental to this development.

III. **METALS**: Metals were used in the early machines of Pascal, Thomas, and the production versions from firms such as Brundsviga, Monroe, etc

IV. **ELECTROMECHANICAL DEVICES**: As differential analyzers, these were present in the early machines of Zuse, Aiken, Stibitz and many others

V. **ELECTRONIC ELEMENTS**: These were used in the Colossus, ABC, ENIAC, and the stored program computers.

This classification really does not apply to developments in the last sixty years because several kinds of new electro technological devices have been used thereafter.

**Classification by Capacity**

Computers can be classified according to their capacity. The term ‘capacity’ refers to the volume of work or the data processing capability a computer can handle. Their performance is determined by the amount of data
that can be stored in memory, speed of internal operation of the computer, number and type of peripheral devices, amount and type of software available for use with the computer.

The capacity of early generation computers was determined by their physical size - the larger the size, the greater the volume. Recent computer technology however is tending to create smaller machines, making it possible to package equivalent speed and capacity in a smaller format. Computer capacity is currently measured by the number of applications that it can run rather than by the volume of data it can process. This classification is therefore done as follows:

1. MICROCOMPUTERS.

The Microcomputer has the lowest level capacity. The machine has memories that are generally made of semiconductors fabricated on silicon chips. Large-scale production of silicon chips began in 1971 and this has been of great use in the production of microcomputers. The microcomputer is a digital computer system that is controlled by a stored program that uses a microprocessor, a programmable read-only memory (ROM) and a random-access memory (RAM). The ROM defines the instructions to be executed by the computer while RAM is the functional equivalent of computer memory.

The Apple IIe, the Radio Shack TRS-80, and the Genie III are examples of microcomputers and are essentially fourth generation devices. Microcomputers have from 4k to 64k storage location and are capable of handling small, single-business application such as sales analysis, inventory, billing and payroll.

II. MINICOMPUTERS

In the 1960s, the growing demand for a smaller stand-alone machine brought about the manufacture of the minicomputer, to handle tasks that large computers could not perform economically. Minicomputer systems provide faster operating speeds and larger storage capacities than microcomputer systems. Operating systems developed for minicomputer systems generally support both multiprogramming and virtual storage. This means that many programs can be run concurrently. This type of computer system is very flexible and can be expanded to meet the needs of users. Minicomputers usually have from 8k to 256k memory storage location, and a relatively established application software. The PDP-8, the IBM systems 3 and the Honeywell 200 and 1200 computer are typical examples of minicomputers.

III. MEDIUM-SIZE COMPUTERS

Medium-size computer systems provide faster operating speeds and larger storage capacities than mini computer systems. They can support a large
number of high-speed input/output devices and several disk drives can be used to provide online access to large data files as required for direct access processing and their operating systems also support both multiprogramming and virtual storage. This allows the running of variety of programs concurrently. A medium-size computer can support a management information system and can therefore serve the needs of a large bank, insurance company or university. They usually have memory sizes ranging from 32k to 512k. The IBM System 370, Burroughs 3500 System and NCR Century 200 system are examples of medium-size computers.

IV. LARGE COMPUTERS

Large computers are next to Super Computers and have bigger capacity than the Medium-size computers. They usually contain full control systems with minimal operator intervention. Large computer system ranges from single-processing configurations to nationwide computer-based networks involving general large computers. Large computers have storage capacities from 512k to 8192k, and these computers have internal operating speeds measured in terms of nanosecond, as compared to small computers where speed is measured in terms of microseconds. Expandability to 8 or even 16 million characters is possible with some of these systems. Such characteristics permit many data processing jobs to be accomplished concurrently. Large computers are usually used in government agencies, large corporations and computer services organizations. They are used in complex modeling, or simulation, business operations, product testing, design and engineering work and in the development of space technology. Large computers can serve as server systems where many smaller computers can be connected to it to form a communication network.

V. SUPER COMPUTERS

The supercomputers are the biggest and fastest machines today and they are used when billion or even trillions of calculations are required. These machines are applied in nuclear weapon development, accurate weather forecasting and as host processors for local computer and time sharing networks. Super computers have capabilities far beyond even the traditional large-scale systems. Their speed ranges from 100 million-instruction-per-second to well over three billion. Because of their size; supercomputers sacrifice a certain amount of flexibility. They are therefore not ideal for providing a variety of user services. For this reason, supercomputers may need the assistance of a medium-size general purpose machines (usually called front-end processor) to handle minor programs or perform slower speed or smaller volume operation.
Classification by their basic operating principle

Using this classification technique, computers can be divided into Analog, Digital and Hybrid systems. They are explained as follows:

I. ANALOG COMPUTERS

Analog computers were well known in the 1940s although they are now uncommon. In such machines, numbers to be used in some calculation were represented by physical quantities - such as electrical voltages. According to the Penguin Dictionary of Computers (1970), “an analog computer must be able to accept inputs which vary with respect to time and directly apply these inputs to various devices within the computer which performs the computing operations of additions, subtraction, multiplication, division, integration and function generation....” The computing units of analog computers respond immediately to the changes which they detect in the input variables. Analog computers excel in solving differential equations and are faster than digital computers.

II. DIGITAL COMPUTERS

Most computers today are digital. They represent information discretely and use a binary (two-step) system that represents each piece of information as a series of zeroes and ones. The Pocket Webster School & Office Dictionary (1990) simply defines Digital computers as “a computer using numbers in calculating.” Digital computers manipulate most data more easily than analog computers. They are designed to process data in numerical form and their circuits perform directly the mathematical operations of addition, subtraction, multiplication, and division. Because digital information is discrete, it can be copied exactly but it is difficult to make exact copies of analog information.

III. HYBRID COMPUTERS

These are machines that can work as both analog and digital computers.

THE COMPUTER EVOLUTION

The computer evolution is indeed an interesting topic that has been explained in some different ways over the years, by many authors. According to The Computational Science Education Project, US, the computer has evolved through the following stages:

The Mechanical Era (1623-1945)

Trying to use machines to solve mathematical problems can be traced to the early 17th century. Wilhelm Schickhard, Blaise Pascal, and Gottfried Leibnitz were among mathematicians who designed and implemented calculators that were capable of addition, subtraction, multiplication, and division included.
The first multi-purpose or programmable computing device was probably Charles Babbage’s Difference Engine, which was begun in 1823 but never completed. In 1842, Babbage designed a more ambitious machine, called the Analytical Engine but unfortunately it also was only partially completed. Babbage, together with Ada Lovelace recognized several important programming techniques, including conditional branches, iterative loops and index variables. Babbage designed the machine which is arguably the first to be used in computational science. In 1933, George Scheutz and his son, Edvard began work on a smaller version of the difference engine and by 1853 they had constructed a machine that could process 15-digit numbers and calculate fourth-order differences. The US Census Bureau was one of the first organizations to use the mechanical computers which used punch-card equipment designed by Herman Hollerith to tabulate data for the 1890 census. In 1911 Hollerith’s company merged with a competitor to found the corporation which in 1924 became International Business Machines (IBM).

**First Generation Electronic Computers (1937-1953)**

These devices used electronic switches, in the form of vacuum tubes; instead of electromechanical relays. The earliest attempt to build an electronic computer was by J. V. Atanasoff, a professor of physics and mathematics at Iowa State in 1937. Atanasoff set out to build a machine that would help his graduate students solve systems of partial differential equations. By 1941 he and graduate student Clifford Berry had succeeded in building a machine that could solve 29 simultaneous equations with 29 unknowns. However, the machine was not programmable, and was more of an electronic calculator.

A second early electronic machine was Colossus, designed by Alan Turing for the British military in 1943. The first general purposes programmable electronic computer was the Electronic Numerical Integrator and Computer (ENIAC), built by J. Presper Eckert and John V. Mauchly at the University of Pennsylvania. Research work began in 1943, funded by the Army Ordinance Department, which needed a way to compute ballistics during World War II. The machine was completed in 1945 and it was used extensively for calculations during the design of the hydrogen bomb. Eckert, Mauchly, and John von Neumann, a consultant to the ENIAC project, began work on a new machine before ENIAC was finished. The main contribution of EDVAC, their new project, was the notion of a stored program. ENIAC was controlled by a set of external switches and dials; to change the program required physically altering the settings on these controls. EDVAC was able to run orders of magnitude faster than ENIAC and by storing instructions in the same medium as data, designers could concentrate on improving the internal structure of the machine without
worrying about matching it to the speed of an external control. Eckert and Mauchly later designed what was arguably the first commercially successful computer, the UNIVAC; in 1952. Software technology during this period was very primitive.

**Second Generation (1954-1962)**

The second generation witnessed several important developments at all levels of computer system design, ranging from the technology used to build the basic circuits to the programming languages used to write scientific applications. Electronic switches in this era were based on discrete diode and transistor technology with a switching time of approximately 0.3 microseconds. The first machines to be built with this technology include TRADIC at Bell Laboratories in 1954 and TX-0 at MIT's Lincoln Laboratory. Index registers were designed for controlling loops and floating point units for calculations based on real numbers. A number of high level programming languages were introduced and these include FORTRAN (1956), ALGOL (1958), and COBOL (1959). Important commercial machines of this era include the IBM 704 and its successors, the 709 and 7094. In the 1950s the first two supercomputers were designed specifically for numeric processing in scientific applications.

**Third Generation (1963-1972)**

Technology changes in this generation include the use of integrated circuits, or ICs (semiconductor devices with several transistors built into one physical component), semiconductor memories, microprogramming as a technique for efficiently designing complex processors and the introduction of operating systems and time-sharing. The first ICs were based on small-scale integration (SSI) circuits, which had around 10 devices per circuit (or ‘chip’), and evolved to the use of medium-scale integrated (MSI) circuits, which had up to 100 devices per chip. Multilayered printed circuits were developed and core memory was replaced by faster, solid state memories.

In 1964, Seymour Cray developed the CDC 6600, which was the first architecture to use functional parallelism. By using 10 separate functional units that could operate simultaneously and 32 independent memory banks, the CDC 6600 was able to attain a computation rate of one million floating point operations per second (Mflops). Five years later CDC released the 7600, also developed by Seymour Cray. The CDC 7600, with its pipelined functional units, is considered to be the first vector processor and was capable of executing at ten Mflops. The IBM 360/91, released during the same period, was roughly twice as fast as the CDC 660.
Early in this third generation, Cambridge University and the University of London cooperated in the development of CPL (Combined Programming Language, 1963). CPL was, according to its authors, an attempt to capture only the important features of the complicated and sophisticated ALGOL. However, like ALGOL, CPL was large with many features that were hard to learn. In an attempt at further simplification, Martin Richards of Cambridge developed a subset of CPL called BCPL (Basic Computer Programming Language, 1967). In 1970 Ken Thompson of Bell Labs developed yet another simplification of CPL called simply B, in connection with an early implementation of the UNIX operating system.

**Fourth Generation (1972-1984)**

Large scale integration (LSI - 1000 devices per chip) and very large scale integration (VLSI - 100,000 devices per chip) were used in the construction of the fourth generation computers. Whole processors could now fit onto a single chip, and for simple systems the entire computer (processor, main memory, and I/O controllers) could fit on one chip. Gate delays dropped to about 1ns per gate. Core memories were replaced by semiconductor memories. Large main memories like CRAY 2 began to replace the older high speed vector processors, such as the CRAY 1, CRAY X-MP and CYBER. In 1972, Dennis Ritchie developed the C language from the design of the CPL and Thompson's B. Thompson and Ritchie then used C to write a version of UNIX for the DEC PDP-11. Other developments in software include very high level languages such as FP (functional programming) and Prolog (programming in logic).

IBM worked with Microsoft during the 1980s to start what we can really call PC (Personal Computer) life today. IBM PC was introduced in October 1981 and it worked with the operating system (software) called Microsoft Disk Operating System (MS DOS). Development of MS DOS began in October 1980 when IBM began searching the market for an operating system for the then proposed IBM PC and major contributors were Bill Gates, Paul Allen and Tim Paterson. In 1983, the Microsoft Windows was announced and this has witnessed several improvements and revision over the last twenty years.

**Fifth Generation (1984-1990)**

This generation brought about the introduction of machines with hundreds of processors that could all be working on different parts of a single program. The scale of integration in semiconductors continued at a great pace and by 1990 it was possible to build chips with a million components - and semiconductor memories became standard on all computers. Computer networks and single-user workstations also became popular.
Parallel processing started in this generation. The Sequent Balance 8000 connected up to 20 processors to a single shared memory module though each processor had its own local cache. The machine was designed to compete with the DEC VAX-780 as a general purpose UNIX system, with each processor working on a different user’s job. However Sequent provided a library of subroutines that would allow programmers to write programs that would use more than one processor, and the machine was widely used to explore parallel algorithms and programming techniques. The Intel iPSC-1, also known as ‘the hypercube’ connected each processor to its own memory and used a network interface to connect processors. This distributed memory architecture meant memory was no longer a problem and large systems with more processors (as many as 128) could be built. Also introduced was a machine, known as a data-parallel or SIMD where there were several thousand very simple processors which work under the direction of a single control unit. Both wide area network (WAN) and local area network (LAN) technology developed rapidly.

**Sixth Generation (1990 - )**

Most of the developments in computer systems since 1990 have not been fundamental changes but have been gradual improvements over established systems. This generation brought about gains in parallel computing in both the hardware and in improved understanding of how to develop algorithms to exploit parallel architectures. Workstation technology continued to improve, with processor designs now using a combination of RISC, pipelining, and parallel processing. Wide area networks, network bandwidth and speed of operation and networking capabilities have kept developing tremendously. Personal computers (PCs) now operate with Gigabit per second processors, multi-Gigabyte disks, hundreds of Mbytes of RAM, colour printers, high-resolution graphic monitors, stereo sound cards and graphical user interfaces. Thousands of software (operating systems and application software) are existing today and Microsoft Inc. has been a major contributor. Microsoft is said to be one of the biggest companies ever, and its chairman – Bill Gates has been rated as the richest man for several years.

Finally, this generation has brought about micro controller technology. Micro controllers are ‘embedded’ inside some other devices (often consumer products) so that they can control the features or actions of the product. They work as small computers inside devices and now serve as essential components in most machines.
THE ACTIVE PLAYERS

Hundreds of people from different parts of the world played prominent roles in the history of computer. This section highlights some of those roles as played in several parts of the world.

The American Participation

America indeed played big roles in the history of computer. John Atanasoff invented the Atanasoff-Berry Computer (ABC) which introduced electronic binary logic in the late 1930s. Atanasoff and Berry completed the computer by 1942, but it was later dismantled.

Howard Aiken is regarded as one of the pioneers who introduced the computer age and he completed the design of four calculators (or computers). Aiken started what is known as computer science today and was one of the first explorers of the application of the new machines to business purposes and machine translation of foreign languages. His first machine was known as Mark I (or the Harvard Mark I), and originally named the IBM ASCC and this was the first machine that could solve complicated mathematical problems by being programmed to execute a series of controlled operations in a specific sequence.

The ENIAC (Electronic Numerical Integrator and Computer) was displayed to the public on February 14, 1946, at the Moore School of Electrical Engineering at the University of Pennsylvania and about fifty years after, a team of students and faculty started the reconstruction of the ENIAC and this was done, using state-of-the-art solid-state CMOS technology.

The German Participation

The DEHOMAG D11 tabulator was invented in Germany. It had a decisive influence on the diffusion of punched card data processing in Germany. The invention took place between the period of 1926 and 1931. Korad Zuse is popularly recognized in Germany as the father of the computer and his Z1, a programmable automaton built from 1936 to 1938, is said to be the world’s ‘first programmable calculating machine’. He built the Z4, a relay computer with a mechanical memory of unique design, during the war years in Berlin. Eduard Stiefel, a professor at the Swiss Federal Institute of Technology (ETH), who was looking for a computer suitable for numerical analysis, discovered the machine in Bavaria in 1949. Around 1938, Konrad Zuse began work on the creation of the Plankalkul, while working on the Z3. He wanted to build a Planfertigungsgerät, and made some progress in this direction in 1943 and in 1944; he prepared a draft of the Plankalkul, which was meant to become a doctoral dissertation some day. The Plankalkul is the first fully-fledged algorithmic programming language. Years later, a small group under the direction of Dr. Heinz Billing constructed
four different computers, the G1 (1952), the G2 (1955), the Gla (1958) and the G3 (1961), at the Max Planck Institute in Gottingen.

Lastly, during the World war II, a young German engineer, Helmut Hoelzer studied the application of electronic analog circuits for the guidance and control system of liquid-propellant rockets and developed a special purpose analog computer, the ‘Mischgerat’ and integrated it into the rocket. The development of the fully electronic, general purpose, analog computer was a spin-off of this work. It was used to simulate ballistic paths by solving the equations of motion.

**The British Participation**

The Colossus was designed and constructed at the Post Office Research Laboratories at Dollis Hill in North London in 1943 to help Bletchley Park in decoding intercepted German telegraphic messages. Colossus was the world’s first large electronic valve programmable logic calculator and ten of them were built and were operational in Bletchley Park, home of Allied World War II code-breaking.

Between 1948 and 1951, four related computers were designed and constructed in Manchester and each machine has its innovative peculiarity. The SEM (June 1948) was the first such machine to work. The Manchester Mark 1 (Intermediate Version, April 1949) was the first full-sized computer available for use. The completed Manchester Mark 1 (October 1949), with a fast random access magnetic drum, was the first computer with a classic two-level store. The Ferranti Mark 1 (February 1951) was the first production computer delivered by a manufacturer. The University of Manchester Small-Scale Experimental Machine, the ‘Baby’ first ran a stored program on June 21, 1948, thus claiming to be the first operational general purpose computer. The Atlas computer was constructed in the Department of Computer Science at the University of Manchester. After its completion in December 1962, it was regarded as the most powerful computer in the world and it had many innovative design features of which the most important were the implementation of virtual addressing and the one-level store.

**The Japanese Participation**

In the second half of the 1950s, many experimental computers were designed and produced by Japanese national laboratories, universities and private companies. In those days, many experiments were carried out using various electronic and mechanical techniques and materials such as relays, vacuum tubes, parametrons, transistors, mercury delay lines, cathode ray tubes, magnetic cores and magnetic drums. These provided a great foundation for the development of electronics in Japan. Between the periods of 1955 and 1959,
computers like ETL-Mark 2, JUJIC, MUSASINO I, ETL-Mark-4, PC-1, ETL-Mark-4a, TAC, Handai-Computer and K-1 were built.

The African Participation

Africa evidently did not play any major roles in the recorded history of computer, but indeed it has played big roles in the last few decades. Particularly worthy of mention is the contribution of a Nigerian who made a mark just before the end of the 20th century. Former American President – Bill Clinton (2000) said “One of the great minds of the Information Age is a Nigerian American named Philip Emeagwali. He had to leave school because his parents couldn’t pay the fees. He lived in a refugee camp during your civil war. He won a scholarship to university and went on to invent a formula that lets computers make 3.1 billion calculations per second....”

Philip Emeagwali, supercomputer and Internet pioneer, was born in 1954, in Nigeria, Africa. In 1989, he invented the formula that used 65,000 separate computer processors to perform 3.1 billion calculations per second. Emeagwali is regarded as one of the fathers of the internet because he invented an international network which is similar to, but predates that of the Internet. He also discovered mathematical equations that enable the petroleum industry to recover more oil. Emeagwali won the 1989 Gordon Bell Prize, computation's Nobel Prize, for inventing a formula that lets computers perform the fastest computations, a work that led to the reinvention of supercomputers.

Conclusion

Researching, studying and writing on ‘History of the Computer’ has indeed been a fulfilling, but challenging task and has brought about greater appreciation of several work done by scientists of old, great developmental research carried out by more recent scientists and of course the impact all such innovations have made on the development of the human race. It has generated greater awareness of the need to study history of the computer as a means of knowing how to develop or improve on existing computer technology. The saying that ‘there is nothing absolutely new under the sun’ is indeed real because the same world resources but fresh ideas have been used over the years to improve on existing technologies.

Allied Gadgets, Peripherals & Digital Reprographic devices

Printer

A computer printer is a computer peripheral device that produces a hard copy (permanent human-readable text and/or graphics, usually on paper) from data stored in a computer connected to it. A printer is used to print anything
that you want, like pictures or documents or data. They plug in where there is a USB slot, from there you can click print and the document is sent to the port where your document is printed.

**Plotter**

The plotter is a computer printer for printing vector graphics. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. It is now commonplace to refer to such wide-format printers as "plotters," even though they technically are not.

A plotter is a very versatile tool. It is sometimes confused with a printer, but a plotter uses line drawings to form an image instead of using dots. A common type of plotter is one that uses a pen or pencil, usually held by a mechanical “arm,” to draw lines on paper as images are typed. It may be a component that is added to a computer system or it may have its own internal computer. It can be used to create layouts, diagrams, specs, and banners.

A plotter may use multiple pens and pencils, which can be easily be changed out in order to create drawings of a different color or drawings that contain more than one color. A plotter is preferred over a printer in many commercial applications, including engineering, because it is far more exact.

Another type of plotter provides the ability to remove pens or pencils and replace them with other tools. This type of plotter is frequently used for commercial sign making. A penknife may be substituted for writing instruments, while pressure sensitive vinyl is frequently substituted for paper. As the sign maker types in letters, numbers, or symbols, the plotter cuts them from vinyl to create lettering for signs, billboards, vehicles, and many other applications. A plotter can generally cut both very tiny and very large images, cutting through the vinyl and leaving the paper backing intact, so the letters can easily be peeled away and applied to a surface.

**Scanner**

A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. Scanners come in and flatbed types and for scanning black-and-white only, or color. Very high resolution scanners are used for scanning for high-resolution printing, but lower resolution scanners are adequate for capturing images for computer display. Scanners usually come with software, such as Adobe's Photoshop product, that lets you resize and otherwise modify a captured image.
Scanners usually attach to your personal computer with a Small Computer System Interface (SCSI). An application such as PhotoShop uses the TWAIN program to read in the image. Some major manufacturers of scanners include: Epson, Hewlett-Packard, Microtek, and Relisys.

**Mouse**

A mouse is a small device that a computer user pushes across a desk surface in order to point to a place on a display screen and to select one or more actions to take from that position. The mouse first became a widely-used computer tool when Apple Computer made it a standard part of the Apple Macintosh. Today, the mouse is an integral part of the graphical user interface (GUI) of any personal computer. The mouse apparently got its name by being about the same size and color as a toy mouse.

A mouse consists of a metal or plastic housing or casing, a ball that sticks out of the bottom of the casing and is rolled on a flat surface, one or more buttons on the top of the casing, and a cable that connects the mouse to the computer. As the ball is moved over the surface in any direction, a sensor sends impulses to the computer that causes a mouse-responsive program to reposition a visible indicator (called a cursor) on the display screen. The positioning is relative to some variable starting place. Viewing the cursor's present position, the user readjusts the position by moving the mouse.

The most conventional kind of mouse has two buttons on top: the left one is used most frequently. In the Windows operating systems, it lets the user click once to send a "Select" indication that provides the user with feedback that a particular position has been selected for further action. The next click on a selected position or two quick clicks on it causes a particular action to take place on the selected object. For example, in Windows operating systems, it causes a program associated with that object to be started. The second button, on the right, usually provides some less-frequently needed capability. For example, when viewing a Web page, you can click on an image to get a popup menu that, among other things, lets you save the image on your hard disk. Some mouses have a third button for additional capabilities. Some mouse manufacturers also provide a version for left-handed people.

Windows 95 and other operating systems let the user adjust the sensitivity of the mouse, including how fast it moves across the screen, and the amount of time that must elapse within a "double click.". In some systems, the user can also choose among several different cursor appearances. Some people use a mousepad to improve traction for the mouse ball.
Although the mouse has become a familiar part of the personal computer, its design continues to evolve and there continue to be other approaches to pointing or positioning on a display. Notebook computers include built-in mouse devices that let you control the cursor by rolling your finger over a built-in trackball. IBM’s ScrollPoint mouse adds a small "stick" between two mouse buttons that lets you scroll a Web page or other content up or down and right or left. Users of graphic design and CAD applications can use a stylus and a specially-sensitive pad to draw as well as move the cursor. Other display screen-positioning ideas include a video camera that tracks the user's eye movement and places the cursor accordingly.

**Keyboard**

A **computer keyboard** is an important device that allows a person to enter symbols like letters and numbers into a computer. It is the main input devices for most computers. There are different types of keyboards. The most popular type is the QWERTY design, which is based on typewriter keyboards. The QWERTY design was made so the most frequently used letters would not jam a mechanical typewriter or typesetting machine. Now there are no more typewriters but the design stayed because people were used to it. QWERTY is the first 6 letters on the upper row of letters on the keyboard. An ergonomic keyboard is made to be easier for people to use, without hurting their hands or arms. The keyboard can type letters, numbers and punctuation, and also lets you control the computer, using special keys like the START button, and the arrow keys. A Dvorak keyboard is an alternative layout.

Keystroke logging is capturing a record of each key that is pressed. Keystroke logging can be used to measure employee activity. Hackers can also use keystroke logging. Scientists discovered that most keyboards give off electromagnetic radiation that can be used to tell which keys have been pressed. Spies could determine what has been typed by remotely sensing such signals. Researchers are studying if keyboards can spread diseases. Some keyboards were found to contain five times more germs than a toilet seat.

**Digital camera**

A digital camera (or digicam) is a camera that takes video or still photographs, or both, digitally by recording images via an electronic image sensor. It is the main device used in the field of digital photography. Most 21st century cameras are digital. Digital cameras can do things film cameras cannot: displaying images on a screen immediately after they are recorded, storing thousands of images on a single small memory device, and deleting images to free storage space. The majority, including most compact cameras, can record
moving video with sound as well as still photographs. Some can crop and stitch pictures and performs other elementary image editing. Some have a GPS receiver built in, and can produce geotagged photographs.

The optical system works the same as in film cameras, typically using a lens with a variable diaphragm to focus light onto an image pickup device. The diaphragm and shutter admit the correct amount of light to the imager, just as with film but the image pickup device is electronic rather than chemical. Most digicams, apart from camera phones and a few specialized types, have a standard tripod screw. Digital cameras are incorporated into many devices ranging from PDAs and mobile phones (called camera phones) to vehicles. The Hubble Space Telescope and other astronomical devices are essentially specialized digital cameras.

**Joystick**

![Joystick Image](image)

**Video game joystick elements:** 1. stick, 2. base, 3. trigger, 4. extra buttons, 5. auto fire switch, 6. throttle, 7. hat switch (POV hat), 8. Suction cup.

A **joystick** is an input device consisting of a stick that pivots on a base and reports its angle or direction to the device it is controlling. Joysticks, also known as 'control columns', are the principal control in the cockpit of many civilian and military aircraft, either as a center stick or side-stick. They often have supplementary switches on them to control other aspects of the aircraft’s flight.

Joysticks are often used to control video games, and usually have one or more push-buttons whose state can also be read by the computer. A popular variation of the joystick used on modern video game consoles is the analog stick. Joysticks are also used for controlling machines such as cranes, trucks, underwater unmanned vehicles, wheelchairs, surveillance cameras and zero...
turning radius lawn mowers. Miniature finger-operated joysticks have been adopted as input devices for smaller electronic equipment such as mobile phones.

**GPS Device**

The Global Positioning System (GPS) is a U.S.-owned utility that provides users with positioning, navigation, and timing (PNT) services. This system consists of three segments: the space segment, the control segment, and the user segment. The U.S. Air Force develops, maintains, and operates the space and control segments. The Global Positioning System is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible by anyone with a GPS receiver.

The GPS program provides critical capabilities to military, civil and commercial users around the world. In addition, GPS is the backbone for modernizing the global air traffic system. The GPS project was developed in 1973 to overcome the limitations of previous navigation systems, integrating ideas from several predecessors, including a number of classified engineering design studies from the 1960s. GPS was created and realized by the U.S. Department of Defense (DOD) and was originally run with 24 satellites. It became fully operational in 1994.

Advances in technology and new demands on the existing system have now led to efforts to modernize the GPS system and implement the next generation of GPS III satellites and Next Generation Operational Control System (OCX). Announcements from the Vice President and the White House in 1998 initiated these changes. In 2000, U.S. Congress authorized the modernization effort, referred to as GPS III.

In addition to GPS, other systems are in use or under development. The Russian GLObal NAvigation Satellite System (GLONASS) was in use by only the Russian military, until it was made fully available to civilians in 2007. There are also the planned European Union Galileo positioning system, Chinese Compass navigation system, and Indian Regional Navigational Satellite System.

**Barcode reader**

A barcode reader (or barcode scanner) is an electronic device for reading printed barcodes. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Additionally, nearly all barcode readers contain decoder circuitry analyzing the barcode's
image data provided by the sensor and sending the barcode's content to the scanner's output port.

**E-book reader**

An e-book reader, also called an e-book device or e-reader, is a mobile electronic device that is designed primarily for the purpose of reading digital e-books and periodicals. Any device that can display text on a screen may act as an e-book reader, but specialised e-book reader designs may optimise portability, readability (especially in bright sun) and battery life for this purpose. A single e-book holds the equivalent of many printed texts with no added mass or bulk.

An e-book reader is similar in form to a tablet computer. A tablet computer typically has a faster screen capable of higher refresh rates which makes them more suitable for interaction. Tablet computers also are much more versatile, allowing one to consume multiple types of content, as well as create it. The main advantages of e-book readers are better readability of their screens especially in bright sunlight and longer battery life. This is achieved by using electronic paper technology to display content to readers.

E-book readers typically have some form of internet connection and sometimes have a relationship to a digital e-book seller, allowing the user to buy and receive digital e-books through this seller. In this way the books owned by the user are managed in the cloud, and the e-book reader is able to download material from any location. An e-book reader may also download material from a computer or read it from a memory card.

Research released in March 2011 indicated that e-books and e-book readers are more popular with the older generation than the younger generation in the UK. The survey carried out by Silver Poll found that around 6% of over-55s owned an e-book reader compared with just 5% of 18 to 24-year-olds. According to an IDC study from March 2011, sales for all e-book readers worldwide rose to 12.8 million in 2010; 48% of them were Kindle models, followed by Barnes & Noble Nook devices, Pandigital, Hanvon and Sony Readers (about 800,000 units for 2010).

It has been reported that there are differing levels of dissatisfaction among owners of different e-book readers due to the inconsistent availability of sought-after e-book titles. A survey of the number of contemporary and popular titles available from e-book stores revealed that Amazon.com has the largest collection, over twice as large as that of Barnes and Noble, Sony Reader Store, Apple iBookstore and OverDrive, the public libraries lending system.
Digital storage media

Digital media storage is used to retain various types of digital media. This may consist of images, audio, video, or even text files. Storage may be required to help an organization facilitate disaster recovery, or to simply allow an individual to save family photos. There are many different types of digital media storage, with memory cards, hard drives, and CD/DVD media being among the most common.

Memory cards are typically used for digital media storage in modern digital cameras. These cards are available in many varieties; including memory sticks, flash cards, and PC cards. Due to their small size and shape, memory cards are often difficult to label and organize for storage purposes. Therefore, they may not be the best digital storage for long-term needs. Some users work their way around this by installing their digital files onto a computer hard drive, and then transferring them to another storage facility at a later time.

Hard drives are a form of digital storage media found in personal computers and servers. While they vary in terms of capacity; they are usually cheaper per megabyte than memory cards. A hard drive is capable of storing large amounts of digital media, but is not recommended as an exclusive storage solution. This is because computers are vulnerable to data loss that originates from malware infection, file corruption, and accidental deletion. If the hard drive fails for any reason, it would be very difficult to retrieve the data it contained.

CD and DVD represent one of the most widely used forms of digital media storage. Both are typically used to store files that have been copied from a computer hard drive. The key difference is that DVD media has a larger capacity. For example, the average DVD is capable of storing 4.7 gigabytes worth of data, while most CDs only hold 700 megabytes. These types of digital media storage offer convenience, but are often viewed as temporary solutions. The slightest damage to a CD or DVD could make the information on the disc inaccessible.

Users who require a more reliable form of digital media storage may prefer third-party offsite solutions. These services are often sought after by individuals and organizations that cannot afford to suffer a catastrophic loss of data. By storing data in a secure, remote location, these digital assets are less susceptible to theft, flood, fire, and other unforeseen disasters that could occur at the home location.

Server (computing)

In the context of client-server architecture, a server is a computer program running to serve the requests of other programs, the "clients". Thus, the "server" performs some computational task on behalf of "clients". The clients either run
on the same computer or connect through the network. In most common use, server is a physical computer (a computer hardware system) dedicated to running one or more such services (as a host), to serve the needs of users of the other computers on the network. Depending on the computing service that it offers it could be a database server, file server, mail server, print server, web server, or some other kind of server. In the context of Internet Protocol (IP) networking, a server is a program that operates as a socket listener. Servers often provides essential services across a network, either to private users inside a large organization or to public users via the Internet.

Usage

The term server is used quite broadly in information technology. Despite the many server-branded products available (such as server versions of hardware, software or operating systems), in theory any computerised process that shares a resource to one or more client processes is a server. To illustrate this, take the common example of file sharing. While the existence of files on a machine does not classify it as a server, the mechanism which shares these files to clients by the operating system is the server.

Similarly, consider a web server application (such as the multiplatform "Apache HTTP Server"). This web server software can be run on any capable computer. For example, while a laptop or personal computer is not typically known as a server, they can in these situations fulfill the role of one, and hence be labelled as one. It is, in this case, the machine's role that places it in the category of server. In the hardware sense, the word server typically designates computer models intended for hosting software applications under the heavy demand of a network environment. In this client–server configuration one or more machines, either a computer or a computer appliance, share information with each other with one acting as a host for the others.

While nearly any personal computer is capable of acting as a network server, a dedicated server will contain features making it more suitable for production environments. These features may include a faster CPU, increased high-performance RAM, and increased storage capacity in the form of a larger or multiple hard drives. Servers also typically have fault tolerant features, such as redundancy in power supplies, storage (as in RAID), and network connections.

Servers became common in the early 1990s as businesses increasingly began using personal computers to provide services formerly hosted on larger mainframes or minicomputers. Early file servers housed multiple CD-ROM drives, which were used to host large database applications. Between the 1990s and 2000s an increase in the use of dedicated hardware saw the advent of self-
contained server appliances. One well-known product is the Google Search Appliance, a unit that combines hardware and software in an out-of-the-box packaging. Simpler examples of such appliances include switches, routers, gateways, and print server, all of which are available in a near plug-and-play configuration.

Modern operating systems such as Microsoft Windows or Linux distributions rightfully seem to be designed with a client–server architecture in mind. These operating systems attempt to abstract hardware, allowing a wide variety of software to work with components of the computer. In a sense, the operating system can be seen as serving hardware to the software, which in all but low-level programming languages must interact using an API.

These operating systems may be able to run programs in the background called either services or daemons. Such programs, such as the aforementioned Apache HTTP Server software, may wait in a sleep state for their necessity to become apparent. Since any software that provides services can be called a server, modern personal computers can be seen as a forest of servers and clients operating in parallel. The Internet itself is also a forest of servers and clients. Merely requesting a web page from a few kilometers away involves satisfying a stack of protocols that involve many examples of hardware and software servers. The least of these are the routers, modems, domain name servers, and various other servers necessary to provide us the World Wide Web.

**Server hardware**

Hardware requirements for servers vary, depending on the server application. Absolute CPU speed is not usually as critical to a server as it is to a desktop machine. Servers’ duty to provide service to many users over a network lead to different requirements such as fast network connections and high I/O throughput. Since servers are usually accessed over a network, they may run in headless mode without a monitor or input device. Processes that are not needed for the server's function are not used. Many servers do not have a graphical user interface (GUI) as it is unnecessary and consumes resources that could be allocated elsewhere. Similarly, audio and USB interfaces may be omitted.

Servers often run for long periods without interruption and availability must often be very high, making hardware reliability and durability extremely important. Although servers can be built from commodity computer parts, mission-critical enterprise servers are ideally very fault tolerant and use specialized hardware with low failure rates in order to maximize uptime, for even a short-term failure can cost more than purchasing and installing the system. For example, it may take only a few minutes of down time at a national stock
exchange to justify the expense of entirely replacing the system with something more reliable. Servers may incorporate faster, higher-capacity hard drives, larger computer fans or water cooling to help remove heat, and uninterruptible power supplies that ensure the servers continue to function in the event of a power failure. These components offer higher performance and reliability at a correspondingly higher price. Hardware redundancy—installing more than one instance of modules such as power supplies and hard disks arranged so that if one fails another is automatically available—is widely used. ECC memory devices that detect and correct errors are used; non-ECC memory is more likely to cause data corruption.

To increase reliability, most of the servers use memory with error detection and correction, redundant disks, redundant power supplies and so on. Such components are also frequently hot swappable, allowing technicians to replace them on the running server without shutting it down. To prevent overheating, servers often have more powerful fans. As servers are usually administered by qualified engineers, their operating systems are also more tuned for stability and performance than for user friendliness and ease of use, Linux taking noticeably larger percentage than for desktop computers.

As servers need a stable power supply, good Internet access, increased security and are also noisy, it is usual to store them in dedicated server centers or special rooms. This requires reducing the power consumption, as extra energy used generates more heat thus causing the temperature in the room to exceed the acceptable limits; hence normally, server rooms are equipped with air conditioning devices. Server casings are usually flat and wide, adapted to store many devices next to each other in server rack. Unlike ordinary computers, servers usually can be configured, powered up and down or rebooted remotely, using out-of-band management.

Many servers take a long time for the hardware to start up and load the operating system. Servers often do extensive pre-boot memory testing and verification and startup of remote management services. The hard drive controllers then start up banks of drives sequentially, rather than all at once, so as not to overload the power supply with startup surges, and afterwards they initiate RAID system pre-checks for correct operation of redundancy. It is common for a machine to take several minutes to start up, but it may not need restarting for months or years.

**Server operating systems**

Server-oriented operating systems tend to have certain features in common that make them more suitable for the server environment, such as
- UGI not available or optional
- ability to reconfigure and update both hardware and software to some extent without restart,
- advanced backup facilities to permit regular and frequent online backups of critical data,
- transparent data transfer between different volumes or devices,
- flexible and advanced networking capabilities,
- automation capabilities such as daemons in UNIX and services in Windows, and
- tight system security, with advanced user, resource, data, and memory protection.

Server-oriented operating systems can, in many cases, interact with hardware sensors to detect conditions such as overheating, processor and disk failure, and consequently alert an operator or take remedial measures themselves. Because servers must supply a restricted range of services to perhaps many users while a desktop computer must carry out a wide range of functions required by its user, the requirements of an operating system for a server are different from those of a desktop machine. While it is possible for an operating system to make a machine both provide services and respond quickly to the requirements of a user, it is usual to use different operating systems on servers and desktop machines. Some operating systems are supplied in both server and desktop versions with similar user interface.

Windows and Mac OS X server operating systems are deployed on a minority of servers, as are other proprietary mainframe operating systems, such as z/OS. The dominant operating systems among servers are UNIX-based or open source kernel distributions, such as Linux (the kernel). The rise of the microprocessor-based server was facilitated by the development of Unix to run on the x86 microprocessor architecture. The Microsoft Windows family of operating systems also runs on x86 hardware and, since Windows NT, have been available in versions suitable for server use.

While the role of server and desktop operating systems remains distinct, improvements in the reliability of both hardware and operating systems have blurred the distinction between the two classes. Today, many desktop and server operating systems share similar code bases, differing mostly in configuration. The shift towards web applications and middleware platforms has also lessened the demand for specialist application servers.
**Types of servers**

In a general network environment the following types of servers may be found.

- Application server, a server dedicated to running certain software applications
- Catalog server, a central search point for information across a distributed network
- Communications server, carrier-grade computing platform for communications networks
- Database server, provides database services to other computer programs or computers
- Fax server, provides fax services for clients
- File server, provides remote access to files
- Game server, a server that video game clients connect to in order to play online together
- Home server, a server for the home
- Name server or DNS
- Print server, provides printer services
- Proxy server, acts as an intermediary for requests from clients seeking resources from other servers
- Sound server, provides multimedia broadcasting, streaming.
- Standalone server, an emulator for client–server (web-based) programs
- Web server, a server that HTTP clients connect to in order to send commands and receive responses along with data contents

Almost the entire structure of the Internet is based upon a client–server model. High-level root nameservers, DNS, and routers direct the traffic on the internet. There are millions of servers connected to the Internet, running continuously throughout the world.

World Wide Web

Domain Name System

E-mail

FTP file transfer

Chat and instant messaging
Voice communication
Streaming audio and video
Online gaming
Database servers

Virtually every action taken by an ordinary Internet user requires one or more interactions with one or more servers. There are also technologies that operate on an inter-server level. Other services do not use dedicated servers; for example peer-to-peer file sharing, some implementations of telephony (e.g. Skype), and supplying television programs to several users (e.g. Kontiki, SlingBox).

**Energy consumption of servers**

In 2010, servers were responsible for 2.5% of energy consumption in the United States. A further 2.5% of United States energy consumption was used by cooling systems required to cool the servers. In 2010 it was estimated that by 2020 servers would use more of the world’s energy than air travel if current trends continued.

**Computer Networks**

Networks are collections of computers, software, and hardware that are all connected to help their users work together. A network connects computers by means of cabling systems, specialized software, and devices that manage data traffic. A network enables users to share files and resources, such as printers, as well as send messages electronically (e-mail) to each other.

Computer networks fall into two main types: client/server networks and peer-to-peer networks. A client/server network uses one or more dedicated machines (the server) to share the files, printers, and applications. A peer-to-peer network allows any user to share files with any other user and doesn’t require a central, dedicated server.

The most common networks are *Local Area Networks* or *LANs* for short. A LAN connects computers within a single geographical location, such as one office building, office suite, or home. By contrast, *Wide Area Networks* (WANs) span different cities or even countries, using phone lines or satellite links.

Networks are often categorized in other ways, too. You can refer to a network by what sort of circuit boards the computers use to link to each other – Ethernet and Token-Ring are the most popular choices. You can also refer to a network by how it packages data for transmission across the cable, with terms
such as TCP/IP (Transmission Control Protocol/Internet Protocol) and IPX/SPX (Internet Package eXchnage/Sequenced Package eXchange).

**Steps to Setting-Up a Network.**

All networks go through roughly the same steps in terms of design, rollout, configuration, and management.

**Designing Your Network**

Plan on the design phase to take anywhere from one to three working days, depending on how much help you have ad how big your network is.

Here are the key tasks:

- Settle on a peer-to-peer network or a client/server network.
- Pick you network system software.
- Pick a network language.
- Figure out what hardware you need.
- Decide on what degree of information security you need.
- Choose software and hardware solutions to handle day-to-day management chores.

**Rolling Out Your Network**

Rolling out your network requires the following steps:

- Run and test network cables.
- Install the server or servers if you’re setting up a client/server network. (If you are setting up a peer-to-peer network, you typically don’t have to worry about any dedicated servers.)
- Set up the workstation hardware.
- Plug in and cable the Network Interface Cards (NICs – these connect the network to the LAN).
- Install the hub or hubs (if you are using twisted-pair cable).
- Install printers.
- Load up the server software (the NOS, or Network Operating System) if your network is a client/server type.
- Install the workstation software.
- Install modem hardware for remote dial-up (if you want the users to be able to dial into the network).
• Install the programs you want to run (application software).

Configuring Your Network

Network configuration means customizing the network for your own use.

• Creating network accounts for your users (names, passwords, and groups).
• Creating areas on shared disk drives for users to share data files.
• Creating areas on shared disk drives for users to share programs (unless everyone runs programs from their own computer).
• Setting up print queues (the software that lets users share networked printers).
• Installing network support on user workstations, so they can "talk" to your network.

Managing Your Network

The work you do right after your LAN is up and running and configured can save you huge amounts of time in the coming months.

• Mapping your network for easier management and troubleshooting.
• Setting up appropriate security measures to protect against accidental and intentional harm.
• Tuning up your LAN so that you get the best possible speed from it.
• Creating company standards for adding hardware and software, so you don’t have nagging compatibility problems later.
• Putting backup systems in place so that you have copies of data and programs if your hardware fails.
• Installing some monitoring and diagnostic software so that you can check on your network’s health and get an early warning of impending problems.
• Figuring out how you plan to handle troubleshooting – educating your LAN administrator, setting up a support contract with a software vendor, and so on.

Smooth Setup

One key advantage of a peer-to-peer network is that it’s easy to setup. With the simplest sort of peer-to-peer network, you just use the built-in networking that comes with your operating system (Windows 98, Windows 95, MacOS, and so on) and you have very little software to set up – even less if you have computers that have the operating system preinstalled, as most computers do these days.
For Windows 95 and Windows 98, the basic steps to setting up a peer-to-peer network are as follows:

1. Sketch out your workgroup map.
2. Figure out a naming convention (set rules for naming individual computers).
3. Go to the first computer on your network and click Start – Settings – Control Panel.
4. Double-click the Network icon to display the Network dialog box.
5. Click the Configuration tab (if it isn’t already in the foreground).
6. Click the File and Print Sharing button.
7. Click both checkboxes so that they appear checked, and then click OK.
8. Click the Identification tab.
9. Make the computer a member of the workgroup by typing the workgroup name in the Workgroup: text box.
10. Give the computer a unique name in the Computer name: text box.
11. Repeat Steps 3-10 for each workstation in your new workgroup.
12. Teach all the network users how to share files, directories, and printers.

Another key advantage of peer-to-peer networking is that you don’t have to buy a computer that nobody can use as a client workstation (something that client/server networking requires). Peer-to-peer networking offers other cost advantages:

- The software is usually free. It either comes bundled with the workstation operating system or it is an inexpensive addition.
- The software is simple. You don’t have to spend the money and time required training someone to learn a complex, full-featured Network Operating System.
- Administration is easy. Each user is a small-scale network administrator, responsible for whatever that user’s computer shares on the network.

**WIRELESS INTERNET TECHNOLOGY**

The internet technology was established by the scientists or the people of 1960s. At that time they observe that different people want to share different kind of information and researches with others almost in every field. As a result of these thinking internet become so popular among the people and now a days it become powerful and useful technology of communication. Few years back
Wireless has grown rapidly and the people especially travelers search for the WIFI ‘hot spots’ to use the internet technology wirelessly.

An internet technology which operates wirelessly with high speed, high data transfer rate at any location any time is referred to as Wireless Internet technology. This technology is being into use as a result of wireless networks and telecommunication network. In wireless Internet, the wireless router sends the signals to the remote server and the server bounces the signals back to the wireless router so the connection can be made for the wireless Internet service. Wireless technology allows us to use our equipment without the hassles of cable connected devices. These devices work by sending data from one location to another by bouncing signals off antennas from the device. Wireless Internet operates with two basic tools: 1) a type of card in your computer that receives the wireless signal and 2) a nearby device called an access point or base station that emits the wireless signals. With these explanations we can think about to do work on internet wirelessly.

**Applications of Wireless Internet Technology:**

Wireless internet is applicable almost on all types of communication networks such as telecommunication networks, browsing etc. There are different kinds of residential applications of this technology such as fast internet, good downloading speed, voice chat easily and television also. It is also applicable on different types of businesses like web hosting, ASPs, video conference, data transferring, VPNs, PBX etcetera are many more emerging technologies which enhances the wireless internet technology such as Gigabit Ethernet, passive optical network, optical switching, mobile IP and Video IP. As wireless Internet technology advances, personal digital assistants, blackberry devices, and other cell phones or personal computer hybrids will likely increasingly on non-fiber based transmissions. Over the past two years wireless networking has reached further into spaces it has not penetrated before, and you can often find connections in coffee shops, airport lounges and hotels. Some cities are even running wireless broadband networks that cover whole districts and boroughs.

**Main Reasons of Popularity:**

Some of the main reasons which make the wireless internet popular are,

1. Convenience as you can use this network interface at home, the office or anywhere else without hassle.

2. If you are moving to a new location, you can transfer the interface and install it at your new location easily.
3. There is no need for an Ethernet cable to connect computers to each other.
4. WLANs are available anywhere in the world at an affordable cost.

Pros of Wireless Internet Technology:

1. Wireless internet provides super fast broadband speed with no wires and cables.
2. Lot of computers can be attached at the same time with the help of router.
3. Initial costs to the service provider too are reduced as they do not have to lay out expensive cables or pay highly for satellite transmission.
4. Mobility supports productivity.
5. Wireless solutions can provide users with access to real-time information from more places in their organization.

Cones of Wireless Internet Technology:

1. The technology can be unpredictable.
2. There are large chances of disturbance of wireless traffic and hacking up your connection.
3. Your neighbor can steel your internet off by sharing it and your connection becomes slowly hacked.

Mobile phone Technology

A mobile phone (also known as a cellular phone, cell phone and a hand phone) is a device that can make and receive telephone calls over a radio link whilst moving around a wide geographic area. Every day we see a new model and new software as far as mobile phone are concerned. There is boom in mobile phone technology. Now mobile phones are competing with computer and television. And it has become a unique tool where it is substituting computer and television in a single miniature piece. Today mobile phone is capable to access Internet very much as a computer and can download and play a video much like a television.

Mobile phone technology is growing at incredibly faster rate. And now the people are not able to assume- what next? People are finding it difficult to cope up with. The fastest growing industry in the history of mankind and in science has to be mobile phone industry. Frequently introduction of new computerized phone in the market with latest software and accessories has surprised the people, which they never dreamt. It is not a history but few years’ back we remember there was a time when mobile phone concept itself was not born. Few years back payphone were used and people used to wait in queue for making a
call. The first series of mobile phone in the world was analog mobile phones. It was just like in dream everything changed and mobile phone technology taken a turn to change analog technology into digital technology. People thrown their analog phone and replaced it with a high tech digital one.

Those few people who were not tuned with changing technology said 'no' to replace their analog phone with digital, there was no time gap and suddenly there was no company or service center to care for these analog phones. There was no a spare accessory, component or mechanic to handle repair or look after other services. But it was inevitable to replace the analog phone with digital to cope up with technology change. And analog phone became a history.

Now let us move ahead a couple years when there were black and white screen mobile phones. After few years, there was an invention of colour technology that opened up a great charm and many avenues. Capability of a mobile phone to play games and access to Internet brought an impact on the industry - then immediately came inbuilt computerized and highly sensitive camera. Capturing a photo in the mobile phone was a surprise to its users. Now only 10 short years are passed the first digital mobile phone was invented in the world. Look how much technologically distance we have covered. Latest invention of mobile phone industry is - The iPhone. It has just been introduced in the market and whirling the world into its stream. IPhone is sleek in its look and has innumerable features. It is going to make a great impact in the mobile phone industry. Look! Wonder of modern mobile phone technology.

**ATM**

Asynchronous Transfer Mode (ATM) is a standard switching technique, designed to unify telecommunication and computer networks. It uses asynchronous time-division multiplexing, and it encodes data into small, fixed-sized cells. This differs from approaches such as the Internet Protocol or Ethernet that use variable sized packets or frames. ATM provides data link layer services that run over a wide range of OSI physical Layer links. ATM has functional similarity with both circuit switched networking and small packet switched networking. It was designed for a network that must handle both traditional high-throughput data traffic (e.g., file transfers), and real-time, low-latency content such as voice and video. ATM uses a connection-oriented model in which a virtual circuit must be established between two endpoints before the actual data exchange begins. ATM is a core protocol used over the SONET/SDH backbone of the public switched telephone network (PSTN) and Integrated Services Digital Network (ISDN), but its use is declining in favour of All IP.
IT AND SOCIETY

Digital Divide

The Digital Divide, or the digital split, is a social issue referring to the differing amount of information between those who have access to the Internet (especially broadband access) and those who do not have access. The term became popular among concerned parties, such as scholars, policy makers, and advocacy groups, in the late 1990s.

Dimensions of the Divide

Broadly speaking, the difference is not necessarily determined by the access to the Internet, but by access to ICT (Information and Communications Technologies) and to Media that the different segments of society can use. With regards to the Internet, the access is only one aspect, other factors such as the quality of connection and related services should be considered. Today the most discussed issue is the availability of the access at an affordable cost. The problem is often discussed in an international context, indicating certain countries such as the U.S. are far more equipped than other developing countries to exploit the benefits from the rapidly expanding Internet.

The digital divide is not indeed a clear single gap which divides a society into two groups. Researchers report that disadvantage can take such forms as lower-performance computers, lower-quality or high price connections (i.e. narrowband or dialup connection), difficulty of obtaining technical assistance, and lower access to subscription-based contents.

Bridging the Gap

The idea that some information and communication technologies are vital to quality civic life is not new. Some suggest that the Internet and other ICTs are somehow transforming society, improving our mutual understanding, eliminating power differentials, realizing a truly free and democratic world society, and other benefits. In many countries, access to the telephone system is considered such a vital element that governments implement various policies to offer affordable telephone service. Unfortunately some countries lack sufficient telephone lines.

Literacy is arguably another such element, although it is not related to any new technologies or latest technological devices. It is a very widely shared view in many societies that being literate is essential to one’s career, to self-guided learning, to political participation, and to Internet usage. There are a variety of arguments regarding why closing the digital divide is important. The major arguments are the following:
1. Economic equality

Some think that the access to the Internet is a basic component of civil life that some developed countries aim to guarantee for their citizens. Telephone is often considered important for security reasons. Health, criminal, and other types of emergencies might indeed be handled better if the person in trouble has an access to the telephone. Another important fact seems to be that much vital information for people’s career, civic life; safety, etc. are increasingly provided via the Internet. Even social welfare services are sometimes administered and offered electronically.

2. Social mobility

Some believe that computer and computer networks play an increasingly important role in their learning and career, so that education should include that of computing and use of the Internet. Without such offerings, the existing digital divide works unfairly to the children in the lower socioeconomic status. In order to provide equal opportunities, governments might offer some form of support.

3. Democracy

Some think that the use of the Internet would lead to a healthier democracy in one way or another. Among the most ambitious visions is that of increased public participation in elections and decision making processes.

4. Economic growth

Some think that the development of information infrastructure and active use of it would be a shortcut to economic growth for less developed nations. Information technologies in general tend to be associated with productivity improvements. The exploitation of the latest technologies may give industries of certain countries a competitive advantage.

5. Rural areas access

The accessibility of rural areas to the Internet is a test of the digital divide. But nowadays there are different ways to eliminate the digital divide in rural areas. Use of Power lines (PLT and PLC) and satellite communications offer new possibilities of universal access to the Internet, and lack of telephone lines will not limit access. Lower access prices are required to bridge the ICT divide.

6. Disabilities

Disabilities of potential Internet users constitute another type of divide and care should be taken to avoid that persons with disabilities be left out of Internet access.
Cyberethics

Cyberethics is the study of ethics pertaining to computer networks, encompassing user behavior and what networked computers are programmed to do, and how this affects individuals and society. Examples of cyberethical questions include "Is it OK to display personal information about others on the Internet (such as their online status or their present location via GPS)?" "Should users be protected from false information?" "Who owns digital data (such as music, movies, books, web pages, etc.) and what should users be allowed to do with it?" "How much access should there be to gambling and porn online?" "Is access to the Internet a basic right that everyone should have?"

Privacy

In the late 18th century, the invention of cameras spurred similar ethical debates as the internet does today. During a Harvard Law Review seminal in 1890, Warren and Brandeis defined privacy from an ethical and moral point of view to be "central to dignity and individuality and personhood. Privacy is also indispensable to a sense of autonomy - to 'a feeling that there is an area of an individual's life that is totally under his or her control, an area that is free from outside intrusion.' The deprivation of privacy can even endanger a person's health." Over 100 years later, the internet and proliferation of private data through governments and ecommerce is a phenomenon which requires a new round of ethical debate involving a person's privacy.

Privacy can be decomposed to the limitation of others' access to an individual with "three elements of secrecy, anonymity, and solitude". Anonymity refers to the individual's right to protection from undesired attention. Solitude refers to the lack of physical proximity of an individual to others. Secrecy refers to the protection of personalized information from being freely distributed.

Individuals surrender private information when conducting transactions and registering for services. Ethical business practice protects the privacy of their customers by securing information which may contribute to the loss of secrecy, anonymity, and solitude. Credit card information, social security numbers, phone numbers, mothers' maiden names, addresses and phone numbers freely collected and shared over the internet may lead to a loss of Privacy.

Fraud and impersonation are some of the malicious activities that occur due to the direct or indirect abuse of private information. Identity theft is rising rapidly due to the availability of private information in the internet. For instance, seven million Americans have fallen victim to identity theft in 2002, making it the fastest growing crime in the United States. Public records search engines and
databases are the main culprits contributing to the rise of cybercrime. Listed below are a few recommendations to restrict online databases from proliferating sensitive personnel information.

1. Exclude sensitive unique identifiers from database records such as social security numbers, birth dates, hometown and mothers' maiden names.
2. Exclude phone numbers that are normally unlisted.
3. Clear provision of a method which allows people to have their names removed from a database.
4. Banning the reverse social security number lookup services.

**Private Data Collection**

Data warehouses are used today to collect and store huge amounts of personal data and consumer transactions. These facilities can preserve large volumes of consumer information for an indefinite amount of time. Some of the key architectures contributing to the erosion of privacy include databases, cookies and spyware.

Some may argue that data warehouses are supposed to stand alone and be protected. However, the fact is enough personal information can be gathered from corporate websites and social networking sites to initiate a reverse lookup. Therefore, is it not important to address some of the ethical issues regarding how protected data ends up in the public domain? As a result, identity theft protection businesses are on the rise. Companies such as LifeLock and JPMorgan Chase have begun to capitalize on selling identity theft protection insurance.

**Property**

Ethical debate has long included the concept of property. This concept has created many clashes in the world of cyberethics. One philosophy of the internet is centered on the freedom of information. The controversy over ownership occurs when the property of information is infringed upon or uncertain.

**Intellectual Property Rights**

The ever-increasing speed of the internet and the emergence of compression technology, such as mp3 opened the doors to Peer-to-peer file sharing, a technology that allowed users to anonymously transfer files to each other, previously seen on programs such as Napster or now seen through communications protocol such as BitTorrent. Much of this, however, was copyrighted music and illegal to transfer to other users. Whether it is ethical to transfer copyrighted media is another question.
Proponents of unrestricted file sharing point out how file sharing has given people broader and faster access to media, has increased exposure to new artists, and has reduced the costs of transferring media (including less environmental damage). Supporters of restrictions on file sharing argue that we must protect the income of our artists and other people who work to create our media. This argument is partially answered by pointing to the small proportion of money artists receive from the legitimate sale of media.

We also see a similar debate over intellectual property rights in respect to software ownership. The two opposing views are for closed source software distributed under restrictive licenses or for free and open source software. The argument can be made that restrictions are required because companies would not invest weeks and months in development if there is no incentive for revenue generated from sales and licensing fees. Proponents for open source believe that all programs should be available to anyone who wants to study them.

Digital Rights Management (DRM)

With the introduction of Digital Rights Management software, new issues are raised over whether the subverting of DRM is ethical. Some champion the hackers of DRM as defenders of users' rights, allowing the blind to make audio books of PDFs they receive, allowing people to burn music they have legitimately bought to CD or to transfer it to a new computer. Others see this as nothing but simply a violation of the rights of the intellectual property holders, opening the door to uncompensated use of copyrighted media.

Security

Security has long been a topic of ethical debate. Is it better to protect the common good of the community or rather should we safeguard the rights of the individual? There is a continual dispute over the boundaries between the two and which compromises are right to make. As an ever increasing amount of people connect to the internet and more and more personal data is available online there is susceptibility to identity theft, cyber crimes and computer hacking. This also leads to the question of who has the right to regulate the internet in the interest of security.

Accuracy

Due to the ease of accessibility and sometimes collective nature of the internet we often come across issues of accuracy e.g. who is responsible for the authenticity and fidelity of the information available online? Ethically this includes debate over who should be allowed to contribute content and who should be held accountable if there are errors in the content or if it is false. This
also brings up the question of how is the injured party, if any, to be made whole and under which jurisdiction does the offense lay?

**Accessibility, Censorship and Filtering**

Accessibility, censorship and filtering bring up many ethical issues that have several branches in cyberethics. Many questions have arisen which continue to challenge our understanding of privacy, security and our participation in society. Throughout the centuries mechanisms have been constructed in the name of protection and security. Today the applications are in the form of software that filters domains and content so that they may not be easily accessed or obtained without elaborate circumvention or on a personal and business level through free or content-control software. Internet censorship and filtering are used to control or suppress the publishing or accessing of information. The legal issues are similar to offline censorship and filtering. The same arguments that apply to offline censorship and filtering apply to online censorship and filtering; whether people are better off with free access to information or should be protected from what is considered by a governing body as harmful, indecent or illicit. The fear of access by minors drives much of the concern and many online advocate groups have sprung up to raise awareness and of controlling the accessibility of minors to the internet.

Censorship and filtering occurs on small to large scales, whether it be a company restricting their employees' access to cyberspace by blocking certain websites which are deemed as relevant only to personal usage and therefore damaging to productivity or on a larger scale where a government creates large firewalls which censor and filter access to certain information available online frequently from outside their country to their citizens and anyone within their borders. One of the most famous examples of a country controlling access is the Golden Shield Project, also referred to as the Great Firewall of China, a censorship and surveillance project set up and operated by the People's Republic of China. Another instance is the 2000 case of the League Against Racism and Antisemitism (LICRA), French Union of Jewish Students, vs. Yahoo! Inc (USA) and Yahoo! France, where the French Court declared that "access by French Internet users to the auction website containing Nazi objects constituted a contravention of French law and an offence to the 'collective memory' of the country and that the simple act of displaying such objects (e.g. exhibition of uniforms, insignia or emblems resembling those worn or displayed by the Nazis) in France constitutes a violation of the Article R645-1 of the Penal Code and is therefore considered as a threat to internal public order.". Since the French judicial ruling many websites must abide by the rules of the countries in which they are accessible.
**Freedom of Information**

Freedom of information, that is the freedom of speech as well as the freedom to seek, obtain and impart information brings up the question of who or what, has the jurisdiction in cyberspace. The right of freedom of information is commonly subject to limitations dependant upon the country, society and culture concerned.

Generally there are three standpoints on the issue as it relates to the internet. First is the argument that the internet is a form of media, put out and accessed by citizens of governments and therefore should be regulated by each individual government within the borders of their respective jurisdictions. Second, is that, "Governments of the Industrial World... have no sovereignty [over the internet] ... We have no elected government, nor are we likely to have one, ... You have no moral right to rule us nor do you possess any methods of enforcement we have true reason to fear.". A third party believes that the internet supersedes all tangible borders such as the borders of countries, authority should be given to an international body since what is legal in one country may be against the law in the other.

**Digital Divide**

An issue specific to the ethical issues of the Freedom of Information is what is known as the digital divide. This refers to the unequal socio-economic divide between those who have access to digital and information technology such as cyberspace and those who have limited or no access at all. This gap of access between countries or regions of the world is called the global digital divide.

**Sexuality and Pornography**

Sexuality in terms of sexual orientation, infidelity, sex with or between minors, public display and pornography has always stirred ethical controversy. These issues are reflected online to varying degrees. One of the largest cyberethical debates is over the regulation, distribution and accessibility of pornography online. Hardcore pornographic material is generally controlled by governments with laws regarding how old one has to be to obtain it and what forms are acceptable or not. The availability of pornography online calls into question jurisdiction as well as brings up the problem of regulation in particular over child pornography, which is illegal in most countries, as well as pornography involving violence or animals, which is restricted within most countries.

**Gambling**

Gambling is often a topic in ethical debate as some view it as inherently wrong and support prohibition while others support no legal interference at all.
"Between these extremes lies a multitude of opinions on what types of gambling the government should permit and where it should be allowed to take place. Discussion of gambling forces public policy makers to deal with issues as diverse as addiction, tribal rights, taxation, senior living, professional and college sports, organized crime, neurobiology, suicide, divorce, and religion.". Due to its controversy gambling is either banned or heavily controlled on local or national levels. The accessibility of the internet and its ability to cross geographic-borders have led to illegal online gambling, often offshore operations. Over the years online gambling, both legal and illegal, has grown exponentially which has led to difficulties in regulation. This enormous growth has even called into question by some the ethical place of gambling online.

**Organizations Related to Cyberethics**

The following organizations are of notable interest in the cyberethics debate:

- International Federation for Information Processing (IFIP)
- Association for Computer Machinery, Special Interest Group: Computers and Society (SIGCAS)
- Ethical and Professional Issues in Computing (EPIC)
- Electronic Frontier Foundation (EFF) • International Center for Information Ethics (ICIE)
- Directions and Implications in Advanced Computing (DIAC)
- The Centre for Computing and Social Responsibility (CCSR)
- Cyber-Rights and Cyber-liberties
- International Journal of Cyber Ethics in Education IJCEE (www.igi-global.com/ijcee)

**Codes of Ethics in Computing**

Information Technology managers are required to establish a set of ethical standards common to their organization. There are many examples of ethical code currently published that can be tailored to fit any organization. Code of ethics is an instrument that establishes a common ethical framework for a large group of people. Four well known examples of Code of Ethics for IT professionals are listed below:

**RFC 1087**

In January 1989, the Internet Architecture Board (IAB) in RFC 1087 defines an activity as unethical and unacceptable if it:
1. Seeks to gain unauthorized access to the resources of the Internet.
2. Disrupts the intended use of the Internet.
3. Wastes resources (people, capacity, and computer) through such actions.
4. Destroys the integrity of computer-based information, or
5. Compromises the privacy of users (RFC 1087, 1989).

The Code of Fair Information Practices

The Code of Fair Information Practices is based on five principles outlining the requirements for records keeping systems. This requirement was implemented in 1973 by the U.S. Department of Health, Education and Welfare.

1. There must be no personal data record-keeping systems whose very existence is secret.
2. There must be a way for a person to find out what information about the person is in a record and how it is used.
3. There must be a way for a person to prevent information about the person that was obtained for one purpose from being used or made available for other purposes without the person's consent.
4. There must be a way for a person to correct or amend a record of identifiable information about the person.
5. Any organization creating, maintaining, using, or disseminating records of identifiable personal data must assure the reliability of the data for their intended use and must take precautions to prevent misuses of the data.

Ten Commandments of Computer Ethics

The ethical values as defined in 1992 by the Computer Ethics Institute; a nonprofit organization whose mission is to advance technology by ethical means, lists these rules as a guide to computer ethics:

1. Thou shalt not use a computer to harm other people.
2. Thou shalt not interfere with other people's computer work.
3. Thou shalt not snoop around in other people's computer files.
4. Thou shalt not use a computer to steal.
5. Thou shalt not use a computer to bear false witness.
6. Thou shalt not copy or use proprietary software for which you have not paid.
7. Thou shalt not use other people's computer resources without authorization or proper compensation.

8. Thou shalt not appropriate other people's intellectual output.

9. Thou shalt think about the social consequences of the program you are writing or the system you are designing.

10. Thou shalt always use a computer in ways that ensure consideration and respect for your fellow humans.

(ISC) 2 Code of Ethics

(ISC) 2 an organization committed to certification of computer security professional has further defined its own Code of Ethics generally as:

1. Act honestly, justly, responsibly, and legally, and protecting the commonwealth.

2. Work diligently and provide competent services and advance the security profession.

3. Encourage the growth of research – teach, mentor, and value the certification.

4. Discourage unsafe practices, and preserve and strengthen the integrity of public infrastructures.

5. Observe and abide by all contracts, expressed or implied, and give prudent advice.

6. Avoid any conflict of interest, respect the trust that others put in you, and take on only those jobs you are qualified to perform.

7. Stay current on skills, and do not become involved with activities that could injure the reputation of other security professionals.

CYBER CRIME

Introduction

The term ‘cyber crime’ is a misnomer. This term has nowhere been defined in any statute /Act passed or enacted by the Indian Parliament. The concept of cyber crime is not radically different from the concept of conventional crime. Both include conduct whether act or omission, which cause breach of rules of law and counterbalanced by the sanction of the state. Before evaluating the concept of cyber crime it is obvious that the concept of conventional crime should be discussed and the points of similarity and deviance between both these forms may be discussed.
**Conventional Crime.**

Crime is a social and economic phenomenon and is as old as the human society. Crime is a legal concept and has the sanction of the law. Crime or an offence is “a legal wrong that can be followed by criminal proceedings which may result into punishment.” The hallmark of criminality is that, it is breach of the criminal law. Per Lord Atkin “the criminal quality of an act cannot be discovered by reference to any standard but one: is the act prohibited with penal consequences”. A crime may be said to be any conduct accompanied by act or omission prohibited by law and consequential breach of which is visited by penal consequences.

**Cyber Crime.**

Cyber crime is the latest and perhaps the most complicated problem in the cyber world. “Cyber crime may be said to be those species, of which, genus is the conventional crime, and where either the computer is an object or subject of the conduct constituting crime”. “Any criminal activity that uses a computer either as an instrumentality, target or a means for perpetuating further crimes comes within the ambit of cyber crime”

A generalized definition of cyber crime may be “unlawful acts wherein the computer is either a tool or target or both” The computer may be used as a tool in the following kinds of activity- financial crimes, sale of illegal articles, pornography, online gambling, intellectual property crime, e-mail spoofing, forgery, cyber defamation, cyber stalking. The computer may however be target for unlawful acts in the following cases- unauthorized access to computer/ computer system/ computer networks, theft of information contained in the electronic form, e-mail bombing, data didling, salami attacks, logic bombs, Trojan attacks, internet time thefts, web jacking, theft of computer system, physically damaging the computer system.

**Distinction between conventional and cyber crime**

There is apparently no distinction between cyber and conventional crime. However on a deep introspection we may say that there exists a fine line of demarcation between the conventional and cyber crime, which is appreciable. The demarcation, lies in the involvement of the medium in cases of cyber crime. The sine qua non for cyber crime is that there should be an involvement, at any stage, of the virtual cyber medium.

**Reasons for cyber crime.**

Hart in his work “The Concept of Law” has said ‘human beings are vulnerable so rule of law is required to protect them’. Applying this to the
cyberspace we may say that computers are vulnerable so rule of law is required to protect and safeguard them against cyber crime. The reasons for the vulnerability of computers may be said to be:

1. **Capacity to store data in comparatively small space**-

   The computer has unique characteristic of storing data in a very small space. This affords to remove or derive information either through physical or virtual medium makes it much easier.

2. **Easy to access**-

   The problem encountered in guarding a computer system from unauthorised access is that there is every possibility of breach not due to human error but due to the complex technology. By secretly implanted logic bomb, key loggers that can steal access codes, advanced voice recorders; retina imagers etc. that can fool biometric systems and bypass firewalls can be utilized to get past many a security system.

3. **Complex**-

   The computers work on operating systems and these operating systems in turn are composed of millions of codes. Human mind is fallible and it is not possible that there might not be a lapse at any stage. The cyber criminals take advantage of these lacunas and penetrate into the computer system.

4. **Negligence**-

   Negligence is very closely connected with human conduct. It is therefore very probable that while protecting the computer system there might be any negligence, which in turn provides a cyber criminal to gain access and control over the computer system.

5. **Loss of evidence**-

   Loss of evidence is a very common & obvious problem as all the data are routinely destroyed. Further collection of data outside the territorial extent also paralyses this system of crime investigation.

**CYBER CRIMINALS**

The cyber criminals constitute of various groups/ category. This division may be justified on the basis of the object that they have in their mind. The following are the category of cyber criminals-

1. **Children and adolescents between the age group of 6 – 18 years** –

   The simple reason for this type of delinquent behaviour pattern in children is seen mostly due to the inquisitiveness to know and explore the things. Other
cognate reason may be to prove themselves to be outstanding amongst other children in their group. Further the reasons may be psychological even. E.g. the *Bal Bharati* (Delhi) case was the outcome of harassment of the delinquent by his friends.

2. **Organised hackers**-

These kinds of hackers are mostly organised together to fulfil certain objective. The reason may be to fulfil their political bias, fundamentalism, etc. The Pakistanis are said to be one of the best quality hackers in the world. They mainly target the Indian government sites with the purpose to fulfil their political objectives. Further the *NASA* as well as the *Microsoft* sites is always under attack by the hackers.

3. **Professional hackers / crackers** –

Their work is motivated by the colour of money. These kinds of hackers are mostly employed to hack the site of the rivals and get credible, reliable and valuable information. Further they are ven employed to crack the system of the employer basically as a measure to make it safer by detecting the loopholes.

4. **Discontented employees**–

This group include those people who have been either sacked by their employer or are dissatisfied with their employer. To avenge they normally hack the system of their employee.

**MODE AND MANNER OF COMMITTING CYBER CRIME**

1. **Unauthorized access to computer systems or networks / Hacking**-

This kind of offence is normally referred as hacking in the generic sense. However the framers of the information technology act 2000 have no where used this term so to avoid any confusion we would not interchangeably use the word hacking for ‘unauthorized access’ as the latter has wide connotation.

2. **Theft of information contained in electronic form**-

This includes information stored in computer hard disks, removable storage media etc. Theft may be either by appropriating the data physically or by tampering them through the virtual medium.

3. **Email bombing**-

This kind of activity refers to sending large numbers of mail to the victim, which may be an individual or a company or even mail servers there by ultimately resulting into crashing.
4. **Data diddling**

This kind of an attack involves altering raw data just before a computer processes it and then changing it back after the processing is completed. The electricity board faced similar problem of data diddling while the department was being computerised.

5. **Salami attacks**

This kind of crime is normally prevalent in the financial institutions or for the purpose of committing financial crimes. An important feature of this type of offence is that the alteration is so small that it would normally go unnoticed. E.g. the *Ziegler case* wherein a logic bomb was introduced in the bank’s system, which deducted 10 cents from every account and deposited it in a particular account.

6. **Denial of Service attack**

The computer of the victim is flooded with more requests than it can handle which cause it to crash. Distributed Denial of Service (DDoS) attack is also a type of denial of service attack, in which the offenders are wide in number and widespread. E.g. *Amazon, Yahoo*.

7. **Virus / worm attacks**

Viruses are programs that attach themselves to a computer or a file and then circulate themselves to other files and to other computers on a network. They usually affect the data on a computer, either by altering or deleting it. Worms, unlike viruses do not need the host to attach themselves to. They merely make functional copies of themselves and do this repeatedly till they eat up all the available space on a computer’s memory. E.g. *love bug virus*, which affected at least 5% of the computers of the globe. The losses were accounted to be $10 million. The world’s most famous worm was the Internet worm let loose on the Internet by *Robert Morris* sometime in 1988. Almost brought development of Internet to a complete halt.

8. **Logic bombs**

These are event dependent programs. This implies that these programs are created to do something only when a certain event (known as a trigger event) occurs. E.g. even some viruses may be termed logic bombs because they lie dormant all through the year and become active only on a particular date (like the *Chernobyl virus*).
9. **Trojan attacks**

This term has its origin in the word ‘Trojan horse’. In software field this means an unauthorized programme, which passively gains control over another’s system by representing itself as an authorised programme. The most common form of installing a Trojan is through e-mail. E.g. a Trojan was installed in the computer of a *lady film director* in the U.S. while chatting. The cyber criminal through the web cam installed in the computer obtained her nude photographs. He further harassed this lady.

10. **Internet time thefts**

Normally in these kinds of thefts the Internet surfing hours of the victim are used up by another person. This is done by gaining access to the login ID and the password. E.g. *Colonel Bajwa’s case*- the Internet hours were used up by any other person. This was perhaps one of the first reported cases related to cyber crime in India. However this case made the police infamous as to their lack of understanding of the nature of cyber crime.

11. **Web jacking**

This term is derived from the term hi jacking. In these kinds of offences the hacker gains access and control over the web site of another. He may even mutilate or change the information on the site. This may be done for fulfilling political objectives or for money. E.g. recently the site of MIT (Ministry of Information Technology) was hacked by the Pakistani hackers and some obscene matter was placed therein. Further the site of Bombay crime branch was also web jacked. Another case of web jacking is that of the ‘gold fish’ case. In this case the site was hacked and the information pertaining to gold fish was changed. Further a ransom of US $ 1 million was demanded as ransom. Thus web jacking is a process where by control over the site of another is made backed by some consideration for it.

**CLASSIFICATION**

The subject of cyber crime may be broadly classified under the following three groups. They are-

1. Against Individuals
   a. their person &
   b. their property of an individual

2. Against Organization
   a. Government
c. Firm, Company, Group of Individuals.

3. Against Society at large

The following are the crimes, which can be committed against the followings group

**Against Individuals:**
- i. Harassment via e-mails.
- ii. Cyber-stalking.
- iii. Dissemination of obscene material.
- iv. Defamation.
- v. Unauthorized control/access over computer system.
- vi. Indecent exposure.
- vii. Email spoofing.
- viii. Cheating & Fraud.

**Against Individual Property:**
- i. Computer vandalism.
- ii. Transmitting virus.
- iii. Netrespass.
- iv. Unauthorized control/access over computer system.
- vi. Internet time thefts.

**Against Organization:**
- i. Unauthorized control/access over computer system.
- ii. Possession of unauthorized information.
- iii. Cyber terrorism against the government organization.
- iv. Distribution of pirated software etc.

**Against Society at large:**
- i. Pornography (basically child pornography).
- ii. Polluting the youth through indecent exposure.
- iii. Trafficking.
- v. Sale of illegal articles.
The above mentioned offences may discuss in brief as follows:

1. **Harassment via e-mails**

   Harassment through e-mails is not a new concept. It is very similar to harassing through letters. Recently I had received a mail from a *lady wherein she complained* about the same. Her former boy friend was sending her mails constantly sometimes emotionally blackmailing her and also threatening her. This is a very common type of harassment via e-mails.

2. **Cyber-stalking**

   The Oxford dictionary defines stalking as "pursuing stealthily". Cyber stalking involves following a person’s movements across the Internet by posting messages (sometimes threatening) on the bulletin boards frequented by the victim, entering the chat-rooms frequented by the victim, constantly bombarding the victim with emails etc.

3. **Dissemination of obscene material/ Indecent exposure/ Pornography (basically child pornography) / Polluting through indecent exposure**

   Pornography on the net may take various forms. It may include the hosting of web site containing this prohibited materials. Use of computers for producing this obscene materials. Downloading through the Internet, obscene materials. These obscene matters may cause harm to the mind of the adolescent and tend to deprave or corrupt their mind. Two known cases of pornography are the *Delhi Bal Bharati case* and the *Bombay case* wherein two Swiss couple used to force the slum children for obscene photographs. The Mumbai police later arrested them.

4. **Defamation**

   It is an act of imputing any person with intent to lower the person in the estimation of the right-thinking members of society generally or to cause him to be shunned or avoided or to expose him to hatred, contempt or ridicule. Cyber defamation is not different from conventional defamation except the involvement of a virtual medium. E.g. the mail account of *Rohit* was hacked and some mails were sent from his account to some of his batch mates regarding his affair with a girl with intent to defame him.
5. **Unauthorized control/access over computer system**

This activity is commonly referred to as hacking. The Indian law has however given a different connotation to the term hacking, so we will not use the term "unauthorized access" interchangeably with the term "hacking" to prevent confusion as the term used in the Act of 2000 is much wider than hacking.

6. **Email spoofing**

A spoofed e-mail may be said to be one, which misrepresents its origin. It shows its origin to be different from which actually it originates. Recently spoofed mails were sent on the name of Mr. Na.Vijayashankar (naavi.org), which contained virus.

Rajesh Manyar, a graduate student at Purdue University in Indiana, was arrested for threatening to detonate a nuclear device in the college campus. The alleged e-mail was sent from the account of another student to the vice president for student services. However the mail was traced to be sent from the account of Rajesh Manyar.

7. **Computer vandalism**

Vandalism means deliberately destroying or damaging property of another. Thus computer vandalism may include within its purview any kind of physical harm done to the computer of any person. These acts may take the form of the theft of a computer, some part of a computer or a peripheral attached to the computer or by physically damaging a computer or its peripherals.

8. **Transmitting virus/worms**

This topic has been adequately dealt herein above.

9. **Intellectual Property crimes / Distribution of pirated software**

Intellectual property consists of a bundle of rights. Any unlawful act by which the owner is deprived completely or partially of his rights is an offence. The common form of IPR violation may be said to be software piracy, copyright infringement, trademark and service mark violation, theft of computer source code, etc.

The Hyderabad Court has in a landmark judgement has convicted three people and sentenced them to six months imprisonment and fine of 50,000 each for unauthorized copying and sell of pirated software.

10. **Cyber terrorism against the government organization**

At this juncture a necessity may be felt that what is the need to distinguish between cyber terrorism and cyber crime. Both are criminal acts. However there
is a compelling need to distinguish between both these crimes. A cyber crime is generally a domestic issue, which may have international consequences; however cyber terrorism is a global concern, which has domestic as well as international consequences. The common form of these terrorist attacks on the Internet is by distributed denial of service attacks, hate websites and hate emails, attacks on sensitive computer networks, etc. Technology savvy terrorists are using 512-bit encryption, which is next to impossible to decrypt. The recent example may be cited of – Osama Bin Laden, the LTTE, attack on America’s army deployment system during Iraq war.

Cyber terrorism may be defined to be “the premeditated use of disruptive activities, or the threat thereof, in cyber space, with the intention to further social, ideological, religious, political or similar objectives, or to intimidate any person in furtherance of such objectives”

Another definition may be attempted to cover within its ambit every act of cyber terrorism.

A terrorist means a person who indulges in wanton killing of persons or in violence or in disruption of services or means of communications essential to the community or in damaging property with the view to –

(1) Putting the public or any section of the public in fear; or

(2) Affecting adversely the harmony between different religious, racial, language or regional groups or castes or communities; or

(3) Coercing or overawing the government established by law; or

(4) Endangering the sovereignty and integrity of the nation

And a cyber terrorist is the person who uses the computer system as a means or ends to achieve the above objectives. Every act done in pursuance thereof is an act of cyber terrorism.

11. Trafficking

Trafficking may assume different forms. It may be trafficking in drugs, human beings; arms weapons etc. These forms of trafficking are going unchecked because they are carried on under pseudonyms. A racket was busted in Chennai where drugs were being sold under the pseudonym of honey.

12. Fraud & Cheating

Online fraud and cheating is one of the most lucrative businesses that are growing today in the cyber space. It may assume different forms. Some of the cases of online fraud and cheating that have come to light are those pertaining to credit card crimes, contractual crimes, offering jobs, etc.
Recently the *Court of Metropolitan Magistrate Delhi* [17] found guilty a 24-year-old engineer working in a call centre, of fraudulently gaining the details of Campa’s credit card and bought a television and a cordless phone from Sony website. Metropolitan magistrate Gulshan Kumar convicted Azim for cheating under IPC, but did not send him to jail. Instead, Azim was asked to furnish a personal bond of Rs 20,000, and was released on a year’s probation.

**STATUTORY PROVISIONS:**

The Indian parliament considered it necessary to give effect to the resolution by which the General Assembly adopted Model Law on Electronic Commerce adopted by the United Nations Commission on Trade Law. As a consequence of which the Information Technology Act 2000 was passed and enforced on 17th May 2000. The preamble of this Act states its objective to legalise e-commerce and further amend the Indian Penal Code 1860, the Indian Evidence Act 1872, the Banker’s Book Evidence Act 1891 and the Reserve Bank of India Act 1934. *The basic purpose to incorporate the changes in these Acts is to make them compatible with the Act of 2000.* So that they may regulate and control the affairs of the cyber world in an effective manner.

The Information Technology Act deals with the various cyber crimes in chapters IX & XI. The important sections are Ss. 43, 65, 66, 67. Section 43 in particular deals with the unauthorised access, unauthorised downloading, virus attacks or any contaminant, causes damage, disruption, denial of access, interference with the service availed by a person. This section provide for a fine up to Rs. 1 Crore by way of remedy. Section 65 deals with ‘*tampering with computer source documents*’ and provides for imprisonment up to 3 years or fine, which may extend up to 2 years or both. Section 66 deals with ‘*hacking with computer system*’ and provides for imprisonment up to 3 years or fine, which may extend up to 2 years or both. Further section 67 deals with publication of obscene material and provides for imprisonment up to a term of 10 years and also with fine up to Rs. 2 lakhs.

**ANALYSIS OF THE STATUTORY PROVISIONS:**

The Information Technology Act 2000 was undoubtedly a welcome step at a time when there was no legislation on this specialised field. The Act has however during its application has proved to be inadequate to a certain extent. The various loopholes in the Act are-

1. *The hurry in which the legislation was passed, without sufficient public debate, did not really serve the desired purpose-*
Experts are of the opinion that one of the reasons for the inadequacy of the legislation has been the hurry in which it was passed by the parliament and it is also a fact that sufficient time was not given for public debate.

2. “Cyberlaws, in their very preamble and aim, state that they are targeted at aiding e-commerce, and are not meant to regulate cybercrime” –

Mr. Pavan Duggal holds the opinion that the main intention of the legislators has been to provide for a law to regulate the e-commerce and with that aim the I.T. Act 2000 was passed, which also is one of the reasons for its inadequacy to deal with cases of cyber crime.

At this point we would like to express my respectful dissent with Mr. Duggal. We feel that the above statement by Mr. Duggal is not fundamentally correct. The reason being that the preamble does state that the Act aims at legalising e-commerce. However it does not stop here. It further amends the I.P.C., Evidence Act, Banker’s Book Evidence and RBI Act also. The Act also aims to deal with all matters connected therewith or incidental thereto. It is a cardinal rule of interpretation that “text should be read as a whole to gather the meaning”. It seems that the above statement has been made in total disregard of this rule of interpretation. The preamble, if read as a whole, makes it very clear that the Act equally aims at legalising e-commerce and to curb any offences arising there from.

3. Cyber torts-

The recent cases including Cyber stalking, cyber harassment, cyber nuisance, and cyber defamation have shown that the I.T. Act 2000 has not dealt with those offences. Further it is also contended that in future new forms of cyber crime will emerge which even need to be taken care of. Therefore India should sign the cyber crime convention. However the I.T. Act 2000 read with the Penal Code is capable of dealing with these felonies.

4. Cyber crime in the Act is neither comprehensive nor exhaustive-

Mr. Duggal believes that we need dedicated legislation on cyber crime that can supplement the Indian Penal Code. The contemporary view is held by Mr. Prathamesh Popat who has stated- “The IT Act, 2000 is not comprehensive enough and doesn’t even define the term ‘cyber crime’” Mr. Duggal has further commented, “India, as a nation, has to cope with an urgent need to regulate and punish those committing cyber crimes, but with no specific provisions to do so. Supporters of the Indian Penal Code School vehemently argue that IPC has stood the test of time and that it is not necessary to incorporate any special laws on cyber crime. This is because it is debated by them that the IPC alone is sufficient for all kinds of crime. However, in practical terms, the argument does not have
appropriate backing. It has to be distinctly understood that cyber crime and cyberspace are completely new whelms, where numerous new possibilities and opportunities emerge by the day in the form of new kinds of crimes."

We feel that a new legislation on cyber crime is totally unwarranted. The reason is that the new legislation not come alone but will bring with it the same confusion, the same dissatisfaction and the same desire to supplant it by further new legislation. Mr. Duggal has stated above the need to supplement IPC by a new legislation. If that is the issue then the present legislation along with the Penal Code when read harmoniously and co-jointly is sufficient to deal with the present problems of cyber crime. Further there are other legislations to deal with the intellectual property crimes on the cyber space such as the Patents Act, Copy Right Act, and Trade Marks Act.

5. Ambiguity in the definitions-

The definition of hacking provided in section 66 of the Act is very wide and capable of misapplication. There is every possibility of this section being misapplied and in fact the Delhi court has misapplied it. The infamous go2nextjob has made it very clear that what may be the fate of a person who is booked under section 66 or the constant threat under which the netizens are till s. 66 exists in its present form. Further section 67 is also vague to certain extent. It is difficult to define the term lascivious information or obscene pornographic information. Further our inability to deal with the cases of cyber pornography has been proved by the Bal Bharati case.

6. Uniform law-

Mr. Vinod Kumar holds the opinion that the need of the hour is a worldwide uniform cyber law to combat cyber crime. Cyber crime is a global phenomenon and therefore the initiative to fight it should come from the same level. E.g. the author of the love bug virus was appreciated by his countrymen.

7. Lack of awareness-

One important reason that the Act of 2000 is not achieving complete success is the lack of awareness among the s about their rights. Further most of the cases are going unreported. If the people are vigilant about their rights the law definitely protects their right. E.g. the Delhi high court in October 2002 prevented a person from selling Microsoft pirated software over an auction site. Achievement was also made in the case before the court of metropolitan magistrate Delhi wherein a person was convicted for online cheating by buying Sony products using a stolen credit card.
8. Jurisdiction issues-

Jurisdiction is also one of the debatable issues in the cases of cyber crime due to the very universal nature of cyber space. With the ever-growing arms of cyber space the territorial concept seems to vanish. New methods of dispute resolution should give way to the conventional methods. The Act of 2000 is very silent on these issues.

9. Extra territorial application-

Though S.75 provides for extra-territorial operations of this law, but they could be meaningful only when backed with provisions recognizing orders and warrants for Information issued by competent authorities outside their jurisdiction and measure for cooperation for exchange of material and evidence of computer crimes between law enforcement agencies.

10. Raising a cyber army-

By using the word ‘cyber army’ by no means I want to convey the idea of virtual army, rather I am laying emphasis on the need for a well equipped task force to deal with the new trends of hi tech crime. The government has taken a leap in this direction by constituting cyber crime cells in all metropolitan and other important cities. Further the establishment of the Cyber Crime Investigation Cell (CCIC) of the Central Bureau of Investigation (CBI) is definitely a welcome step in this direction. There are man cases in which the C.B.I has achieved success. The present position of cases of cyber crime is –

Case 1: When a woman at an MNC started receiving obscene calls, CBI found her colleague had posted her personal details on Mumbaidating.com.

Status: Probe on

Case 2: CBI arrested a man from UP, Mohammed Feroz, who placed ads offering jobs in Germany. He talked to applicants via e-mail and asked them to deposit money in his bank account in Delhi.

Status: Chargesheet not filed

Case 3: The official web-site of the Central Board of Direct Taxes was hacked last year. As Pakistan-based hackers were responsible, authorities there were informed through Interpol.

Status: Pak not cooperating.

11. Cyber savvy bench-

Cyber savvy judges are the need of the day. Judiciary plays a vital role in shaping the enactment according to the order of the day. One such
stage, which needs appreciation, is the **P.I.L., which the Kerela High Court** has accepted through an email. The role of the judges in today’s word may be gathered by the statement- judges carve ‘law is’ to ‘law ought to be’. **Mr T.K.Vishwanathan**, member secretary, **Law Commission**, has highlighted the requirements for introducing e-courts in India. In his article published in The Hindu he has stated “**if there is one area of Governance where IT can make a huge difference to Indian public is in the Judicial System**”.

12. **Dynamic form of cyber crime**-

   Speaking on the dynamic nature of cyber crime FBI Director Louis Freeh has said, "**In short, even though we have markedly improved our capabilities to fight cyber intrusions the problem is growing even faster and we are falling further behind.**” The (de)creativity of human mind cannot be checked by any law. Thus the only way out is the liberal construction while applying the statutory provisions to cyber crime cases.

13. **Hesitation to report offences**-

   As stated above one of the fatal drawbacks of the Act has been the cases going unreported. One obvious reason is the non-cooperative police force. This was proved by the **Delhi time theft case**. "The police are a powerful force today which can play an instrumental role in preventing cybercrime. At the same time, it can also end up wielding the rod and harassing innocent s, preventing them from going about their normal cyber business.” _This attitude of the administration is also revelled by incident that took place at Merrut and Belgam._ (for the facts of these incidents refer to naavi.com). For complete realisation of the provisions of this Act a cooperative police force is require.

**PREVENTION OF CYBER CRIME:**

Prevention is always better than cure. It is always better to take certain precaution while operating the net. A should make them his part of cyber life. Saileshkumar Zarkar, technical advisor and network security consultant to the Mumbai Police Cyber crime Cell, advocates the 5P mantra for online security: **Precaution, Prevention, Protection, Preservation and Perseverance**. A netizen should keep in mind the following things-

1. to prevent cyber stalking avoid disclosing any information pertaining to oneself. This is as good as disclosing your identity to strangers in public place.
2. always avoid sending any photograph online particularly to strangers and chat friends as there have been incidents of misuse of the photographs.

3. always use latest and up date anti virus software to guard against virus attacks.

4. always keep back up volumes so that one may not suffer data loss in case of virus contamination

5. never send your credit card number to any site that is not secured, to guard against frauds.

6. always keep a watch on the sites that your children are accessing to prevent any kind of harassment or depravation in children.

7. it is better to use a security programme that gives control over the cookies and send information back to the site as leaving the cookies unguarded might prove fatal.

8. web site owners should watch traffic and check any irregularity on the site. Putting host-based intrusion detection devices on servers may do this.

9. use of firewalls may be beneficial.

10. web servers running public sites must be physically separate protected from internal corporate network.

    Adjudication of a Cyber Crime - On the directions of the Bombay High Court the Central Government has by a notification dated 25.03.03 has decided that the Secretary to the Information Technology Department in each state by designation would be appointed as the AO for each state.

**Conclusion**

Capacity of human mind is unfathomable. It is not possible to eliminate cyber crime from the cyber space. It is quite possible to check them. History is the witness that no legislation has succeeded in totally eliminating crime from the globe. The only possible step is to make people aware of their rights and duties (to report crime as a collective duty towards the society) and further making the application of the laws more stringent to check crime. Undoubtedly the Act is a historical step in the cyber world. Further we all together do not deny that there is a need to bring changes in the Information Technology Act to make it more effective to combat cyber crime. I would conclude with a word of caution for the pro-legislation school that it should be kept in mind that the provisions of
the cyber law are not made so stringent that it may retard the growth of the industry and prove to be counter-productive.

**Guidelines for Proper Use of Computers**

There are many things to be understood to ensure your integrity and the protection of your instruments when you are online. We can discuss the basics of what is generally called as netiquette.

1. Do not use Email for harassing or threatening others. If you are a recipient of any such messages you can keep of them for legal follow up.
2. Do not send Worms and viruses into cyberspace.
3. Do not send “spam” unwelcome advertisement or unsolicited messages.
4. Do not give out or share with others the e-mail Ids in your contact list without first obtaining permission from the concerned.
5. Do not collect other people’s e-mail addresses for sending “spam” or “bulk” mail.
6. Do not forget to add your correct identity and don’t never pose “anonymous”.
7. Do not use downloaded materials as of your own. Respect proprietary rights, copyright and acknowledge the name of the original author adding a word of appreciation.
8. Do not make using jargons/abbreviations a habit or use foul language. Maintain a higher level of communication.
9. Do not pretend to be what you are not showing the courtesy of addressing others by formal greeting when sending e-mails.

**VIRUSES-TYPES AND EXAMPLES**

Computer virus is a software program written with malicious intentions. There are number of computer viruses that can impede the functioning of your computer system. Let us see what the different types of computer viruses are.

Computer Virus is a malicious software program written intentionally to enter a computer without the user’s permission or knowledge. It has the ability to replicate itself, thus continues to spread. Some viruses do little but replicate, while others can cause severe harm or adversely affect program and performance of the system. A virus should never be assumed harmless and left on a system. Most common types of viruses are mentioned below:
Different Types of Computer Viruses

There are different types of computer viruses which can be classified according to their origin, techniques, types of files they infect, where they hide, the kind of damage they cause, the type of operating system or platform they attack etc. Let us have a look at few of them.

Resident Virus

This type of virus is a permanent as it dwells in the RAM. From there it can overcome and interrupt all the operations executed by the system. It can corrupt files and programs that are opened, closed, copied, renamed etc. Examples: Randex, CMJ, Meve, and MrKlunky.

Direct Action Viruses

The main purpose of this virus is to replicate and take action when it is executed. When a specific condition is met, the virus will go into action and infect files in the directory or folder that it is in as well as directories that are specified in the AUTOEXEC.BAT file path. This batch file is always located in the root directory of the hard disk and carries out certain operations when the computer is booted.

Examples: Vienna virus.

Overwrite Viruses

Virus of this kind is characterized by the fact that it deletes the information contained in the files that it infects, rendering them partially or totally useless once they have been infected. The only way to clean a file infected by an overwrite virus is to delete the file completely, thus losing the original content.

Examples: Way, Trj.Reboot, Trivial.88.D.

Boot Sector Virus

This type of virus affects the boot sector of a floppy or hard disk. This is a crucial part of a disk, in which information of the disk itself is stored along with a program that makes it possible to boot (start) the computer from the disk. The best way of avoiding boot sector viruses is to ensure that floppy disks are write-protected and never starting your computer with an unknown floppy disk in the disk drive.

Examples: Polyboot.B, AntiEXE.

Macro Virus

Macro viruses infect files that are created using certain applications or programs that contain macros. These mini-programs make it possible to automate
series of operations so that they are performed as a single action, thereby saving
the user from having to carry them out one by one.

Examples: Relax, Melissa.A, Bablas, O97M/Y2K.

**Directory Virus**

Directory viruses change the path that indicates the location of a file. When you execute a program file with an extension .EXE or .COM that has been infected by a virus, you are unknowingly running the virus program, while the original file and program is previously moved by the virus. Once infected it becomes impossible to locate the original files.

Examples: Dir-2 virus.

**Polymorphic Virus**

Polymorphic viruses encrypt or encode themselves in a different way (using different algorithms and encryption keys) every time they infect a system. This makes it impossible for anti-viruses to find them using string or signature searches (because they are different in each encryption). The virus then goes on creating a large number of copies.

Examples: Elkern, Marburg, Satan Bug and Tuareg.

**File Infector Virus**

This type of virus infects programs or executable files (files with .EXE or .COM extension). When one of these programs is run, directly or indirectly, the virus is activated, producing the damaging effects it is programmed to carry out. The majority of existing viruses belongs to this category, and can be classified depending on the actions that they carry out.

Examples: Cleevix and Cascade.

**Companion Viruses**

Companion viruses can be considered as a type of file infector viruses like resident or direct action types. They are known as companion viruses because once they get into the system they 'accompany' the other files that already exist. In other words, in order to carry out their infection routines, companion viruses can wait in memory until a program is run (resident virus) or act immediately by making copies of themselves (direct action virus).

Some examples include: Stator, Asimov.1539 and Terrax.1069

**FAT Virus**

The file allocation table or FAT is the part of a disk used to store all the information about the location of files, available space, unusable space etc. FAT
virus attacks the FAT section and may damage crucial information. It can be especially dangerous as it prevents access to certain sections of the disk where important files are stored. Damage caused can result in information losses from individual files or even entire directories.

Examples:

**Multipartite Virus**

These viruses spread in multiple ways possible. It may vary in its action depending upon the operating system installed and the presence of certain files.

Examples: Invader, Flip and Tequila

**Web Scripting Virus**

Many web pages include complex code in order to create an interesting and interactive content. This code is often exploited to bring about certain undesirable actions.

**Worms**

A worm is a program very similar to a virus; it has the ability to self-replicate and can lead to negative effects on your system. But they can be detected and eliminated by anti-viruses.


**Trojans or Trojan Horses**

Another unsavory breed of malicious code are Trojans or Trojan horses, which unlike viruses do not reproduce by infecting other files, nor do they self-replicate like worms. In fact, it is program which disguises itself as a useful program or application.

**Logic Bombs**

They are not considered viruses because they do not replicate. They are not even programs in their own right but rather camouflaged segments of other programs. They are only executed when a certain predefined condition is met. Their objective is to destroy data on the computer once certain conditions have been met. Logic bombs go undetected until launched and the results can be destructive.

Besides, there are many other computer viruses that have a potential to infect your digital data. Hence, it is a must that you protect your data by installing genuine quality anti-virus software.
How to Get Rid of Computer Viruses

Computer viruses are a major threat these days! How to get rid of computer viruses is what we will be discussing here.

Computers have become almost indispensable today. But a computer is after all a machine and it too needs care to remain functional all the time. So wherever Internet technology comes into picture, computer security is a subject of major concern. Read ahead to know how to get rid of computer viruses.

Before we get cracking on how to get rid of computer viruses, let's understand what is a computer virus after all? Computer viruses are malicious programs that start operating anonymously from any location in your system. Like biological viruses; they also replicate themselves and spread from one workstation to another in a network. They are primarily responsible for sudden deletion and corruption of files. Besides, they hamper the security of important documents stored in your system and crash your system's RAM (Random Access Memory). But then how do you come to know about computer virus symptoms? Signs such as an extremely slow system, abrupt reboots, blue error screens, a lot of undefined and random errors and a large number of pop up windows opening simultaneously indicate a possible virus or a spyware attack! There are different types of computer viruses such as spyware, adware, Trojan horses, web bugs and worms which also harm your computer. They self infest without the knowledge of your system and corrupt its sensitive data.

Methods to Get Rid of Computer Viruses

Following are methods adopted to get rid of computer viruses:

Choosing antivirus software: Generally antivirus software is a part of your system as it is pre installed. But the market offers you better choices always. Some of the leading antivirus software includes:

- McAfee
- Norton (A Symantec product)
- AVG
- Avast

Of these, Avast and AVG are some freely downloadable antivirus software. McAfee and Norton are sturdy retail antivirus software of which McAfee is the oldest and Norton is the heaviest. Although Norton is one of the best antivirus programs made, its installation may slowdown the system as it is a bulky program. Nowadays, AVG is quite a popular one as it upgrades itself at regular durations without prompting the user each time.
Using online antivirus software and rescue disks: Computer viruses also upgrade as antivirus programs. At times, they do not let you access the antivirus software installed in your system. So what do you do? There are a few online viruses scanning software that provide free online tools to tackle risky situations:

- McAfee scanner - Most recommended
- Avast Virus cleaner
- Trend Housecall
- Kaspersky online virus scanner
- Panda Activescan

Rescue disks can also help you get rid of such problems. Most antivirus software on installation, ask the user to create a ‘rescue disk’ and prompt him for reboot. Rescue disks load the antivirus software even before the operating system loads. Hence the virus detection and removal becomes easy as the user gets access to antivirus programs. A very crucial point to be remembered is that updation of antivirus software is as important as installing them in the system.

Using anti spyware software: Spyware is a high security risk to your system. These programs spy on your system, steal important information and alter your system configuration. Signs of spyware attacks can be confirmed with unusual changes in web browsers, search engines, random error messages and a very slow system. The best remedy to this problem is installation of a sturdy anti spyware software. There are many free spyware removal programs available in the market, which can be used to get rid of computer viruses. Some of the best recommended anti spyware are:

- Windows Defender
- Webroot
- Spybot search and destroy
- Defensenet
- Bazooka

PC Doctor and Microsoft anti spyware are also extensively used in spyware removal. Mac users can rely on MacScan.

Using anti adware software: Adware is annoying programs that are responsible for the uncontrolled number of pop up advertisements clogging your web browsers. Not only do they slow down your system, but at times self install unnecessary software without the knowledge of the system. For removal of adware, Lavasoft’s Ad-adware is the best!
Using firewall to get rid of computer viruses: Firewalls are either hardware or software and sometimes a combination of both. They regulate network traffic by monitoring port activity of the system based on a set of pre-defined security policies. These policies list IP addresses and ports to be blocked or allowed based on the risk proposed. Some of the best firewall products available in the market are:

- Online Armor Personal Firewall
- Comodo Internet Security
- Little Snitch
- Zone Alarm Free Firewall
- PC Tools Firewall
- Ashampoo Firewall

Of these, Zone Alarm Free Firewall is the best as it has been going sturdy for years now without any major upgradations.

So, whenever there is a slightest doubt of a possible virus attack, there are some immediate action items to confirm your doubts!

1. Stop working. Save the necessary documents and close all the windows.
2. Don’t start deleting files frantically assuming the worst. Stay calm and take a backup of all the important data.
3. Run your antivirus software immediately. In case it asks for any updations, update the software and run it.
4. If problems persist there is a possibility that the system is under a virus/spyware attack.

Some Tips for Intelligent Browsing

1. Browse intelligently. Internet is a web of networks. Hence the system is always prone to virus attacks. Do not visit sites that might be a source of malicious software.

2. Be careful when going for free software downloads as most of them may contain spyware.

3. Maintain secure browser settings every time you access your system. Nowadays, every browser gives users the convenience to adjust browser security settings. Go to Tools and access the security tab to alter browser settings if needed. You may also adjust the settings such that cookies get stored only for secure websites.

4. Firewalls are a must for your system when it comes to network security. However nowadays, Apple’s MAC OS and Windows XP have inbuilt firewall programs.
5. Read online license agreements, privacy statements and security warnings before you download any software. Agreeing under sheer carelessness and ignorance can invite malware. In such cases, consult IT service center or make use of a search engine to check if any form of malware has been reported for the software you want to download. These measures will prevent your system from getting infected with spyware carriers like Kazaa and Grokster.

6. Do not open unsolicited email attachments containing word documents and Powerpoint presentations. These are gateways to install virus in your system. Also, be cautious while clicking on online messages claiming to alert you about your system security risk. Most of the time, they are links for installation of spyware.

7. Spyware threat is obvious in case of peer-to-peer file-sharing services. So it is advised not to download any executable files from such shared connections.

8. Last but not the least, update antivirus and firewall software regularly. Most of them today are self programmed to update themselves after a specific duration.

Prevention is better than cure does not apply to health alone. It is always better to prevent the enemy from attacking rather than letting the enemy attack and then fight.

**Questions**

1. Examine the history from print culture to information technology.
2. Elaborate on the significance of IT in the modern world.
3. Write a short note on first generation of computers.
4. Examine the advantages of the fourth generation of computers.
5. Explain the guidelines for the proper use of computers.
6. Describe the the features of the computers of various generations.
7. What is printer?
8. What is plotter?
9. What is scanner?
10. What is Mouse?
11. Explain the importance of keyboard. What is Joystics?
12. What is GPS?
13. What is Bar Code Reader?
14. Explain the importance of Computer net works.
15. Describe the features of cyber ethics.
16. What is cyber crime?
UNIT-II

INTRODUCTION TO COMPUTER BASICS AND KNOWLEDGE SKILL FOR HIGHER EDUCATION

Operating system (OS)

An operating system (OS) is a set of software that manages computer hardware resources and provides common services for computer programs. The operating system is a vital component of the system software in a computer system. Application programs require an operating system to function. Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting for cost allocation of processor time, mass storage, printing, and other resources.

For hardware functions such as input and output and memory allocation, the operating system acts as an intermediary between programs and the computer hardware, although the application code is usually executed directly by the hardware and will frequently make a system call to an OS function or be interrupted by it. Operating systems can be found on almost any device that contains a computer—from cellular phones and video game consoles to supercomputers and web servers. Examples of popular modern operating systems include Android, BSD, iOS, Linux, Mac OS X, Microsoft Windows, Windows Phone, and IBM z/OS. All these, except Windows and z/OS, share roots in UNIX.

Disk Operating System (DOS)

Disk operating system is one of the premier operating systems used in computer programming. The abbreviated form, DOS, is more popular among the computer users across the globe. The disk operating system is designed to offer all-round support to the secondary storage devices of computer system.

Functions of Disk Operating System

The main function of disk operating system is to coordinate the user and outside devices used in computer system. While operating a computer, user enters some commands. Disk operating system converts these commands into a version which is readable by computer memory. DOS also converts the error messages generated by computers into an understandable format.

If the disk operating system is loaded out of a disk and employed in supporting disk related devices of computer, then it takes control of the whole
operating system. FreeDOS, DOS/360 are some of the examples of disk operating systems, which serve the purpose of the overall operating system.

How to Load Disk Operating System

To load disk operating system, your computer must be equipped with BOOT record. BOOT record enables read-only memory (ROM) to load the disk operating system. Once ROM starts running, it initiates Power On Self Test (POST) which keeps a watch on functioning of computer peripherals. At the end this process, ROM bootstrap starts reading the record of BOOT already stored in the computer system. Immediately after this, the loading process begins to operate. Once the loading is over the boot record gets ready to take the charge of entire computer system and disk operating system becomes active.

Microsoft Windows

Microsoft Windows is a series of operating systems produced by Microsoft. Microsoft introduced an operating environment named Windows on November 20, 1985 as an add-on to MS-DOS in response to the growing interest in graphical user interfaces (GUIs). Microsoft Windows came to dominate the world’s personal computer market, overtaking Mac OS, which had been introduced in 1984. The most recent client version of Windows is Windows 7; the most recent server version is Windows Server 2008 R2; the most recent mobile version is Windows Phone 7.5.

Open source

In production and development, open source is a philosophy, or pragmatic methodology that promotes free redistribution and access to an end product's design and implementation details. Before the phrase open source became widely adopted, developers and producers used a variety of phrases to describe the concept; open source gained hold with the rise of the Internet, and the attendant need for massive retooling of the computing source code. Opening the source code enabled a self-enhancing diversity of production models, communication paths, and interactive communities. The open-source software movement was born to describe the environment that the new copyright, licensing, domain, and consumer issues created.

The open-source model includes the concept of concurrent yet different agendas and differing approaches in production, in contrast with more centralized models of development such as those typically used in commercial software companies. A main principle and practice of open-source software development is peer production by bartering and collaboration, with the end-product, source-material, "blueprints", and documentation available at no cost to
the public. This is increasingly being applied in other fields of endeavor, such as biotechnology.

The concept of free sharing of technological information existed long before computers. For example, cooking recipes have been shared since the beginning of human culture. In the early years of automobile development, a group of capital monopolists owned the rights to a 2-cycle gasoline engine patent originally filed by George B. Selden. By controlling this patent, they were able to monopolize the industry and force car manufacturers to adhere to their demands, or risk a lawsuit. In 1911, independent automaker Henry Ford won a challenge to the Selden patent. The result was that the Selden patent became virtually worthless and a new association (which would eventually become the Motor Vehicle Manufacturers Association) was formed. The new association instituted a cross-licensing agreement among all US auto manufacturers: although each company would develop technology and file patents, these patents were shared openly and without the exchange of money between all the manufacturers. By the time the US entered the second World War, 92 Ford patents and 515 patents from other companies were being shared between these manufacturers, without any exchange of money (or lawsuits).

Very similar to open standards, researchers with access to Advanced Research Projects Agency Network (ARPANET) used a process called Request for Comments to develop telecommunication network protocols. This collaborative process of the 1960s led to the birth of the Internet in 1969. Early instances of the free sharing of source code include IBM’s source releases of its operating systems and other programs in the 1950s and 1960s, and the SHARE user group that formed to facilitate the exchange of software.

In a foreshadowing of the Internet, software with source code included became available on BBS networks in the 1980s. This was sometimes a necessity; distributing software written in BASIC and other interpreted languages can only be distributed as source code as there is no separate portable executable binary to distribute.

Example of BBS systems and networks that gathered source code, and setup up boards specifically to discuss its modification includes WWIV, developed initially in BASIC by Wayne Bell. A culture of "modding" his software and distributing the mods, grew up so extensively that when the software was ported to first Pascal, then C++, its source code continued to be distributed to registered users, who would share mods and compile their own versions of the software. This may have contributed to its being a dominant system and network, despite being outside the FidoNet umbrella that was shared by so many other BBS
The sharing of source code on the Internet began when the Internet was relatively primitive, with software distributed via UUCP, Usenet, and irc, and gopher. Linux, for example, was first widely distributed by posts to comp.os.linux on the Usenet, which is also where its development was discussed. Linux became the archetype for organized software development orientated around the sharing of source code.

The label “open source” was adopted by a group of people in the free software movement at a strategy session held at Palo Alto, California, in reaction to Netscape’s January 1998 announcement of a source code release for Navigator. The group of individuals at the session included Christine Peterson who suggested “open source”, Todd Anderson, Larry Augustin, Jon Hall, Sam Ockman, Michael Tiemann and Eric S. Raymond. Over the next week, Raymond and others worked on spreading the word. Linus Torvalds gave an all-important sanction the following day. Phil Hughes offered a pulpit in Linux Journal. Richard Stallman, pioneer of the free software movement, flirted with adopting the term, but changed his mind. Those people who adopted the term used the opportunity before the release of Navigator’s source code to free themselves of the ideological and confrontational connotations of the term “free software”. Netscape released its source code under the Netscape Public License and later under the Mozilla Public License.

The term was given a big boost at an event organized in April 1998 by technology publisher Tim O’Reilly. Originally titled the “Freeware Summit” and later known as the “Open Source Summit”, The event brought together the leaders of many of the most important free and open-source projects, including Linus Torvalds, Larry Wall, Brian Behlendorf, Eric Allman, Guido van Rossum, Michael Tiemann, Paul Vixie, Jamie Zawinski of Netscape, and Eric Raymond. At that meeting, the confusion caused by the name free software was brought up. Tiemann argued for “sourceware” as a new term, while Raymond argued for “open source.” The assembled developers took a vote, and the winner was announced at a press conference that evening. Five days later, Raymond made the first public call to the free software community to adopt the new term. The Open Source Initiative was formed shortly thereafter.

Starting in the early 2000s, a number of companies began to publish a portion of their source code to claim they were open source, while keeping key parts closed. This led to the development of the now widely used terms free open-source software and commercial open-source software to distinguish between truly open and hybrid forms of open source.
INTERNET

The Internet was the result of some visionary thinking by people in the early 1960s who saw great potential value in allowing computers to share information on research and development in scientific and military fields. J.C.R. Licklider of MIT first proposed a global network of computers in 1962, and moved over to the Defense Advanced Research Projects Agency (DARPA) in late 1962 to head the work to develop it. Leonard Kleinrock of MIT and later UCLA developed the theory of packet switching, which was to form the basis of Internet connections. Lawrence Roberts of MIT connected a Massachusetts computer with a California computer in 1965 over dial-up telephone lines. It showed the feasibility of wide area networking, but also showed that the telephone line’s circuit switching was inadequate. Kleinrock's packet switching theory was confirmed. Roberts moved over to DARPA in 1966 and developed his plan for ARPANET. These visionaries and many more left unnamed here are the real founders of the Internet.

The Internet, then known as ARPANET, was brought online in 1969 under a contract let by the renamed Advanced Research Projects Agency (ARPA) which initially connected four major computers at universities in the southwestern US (UCLA, Stanford Research Institute, UCSB, and the University of Utah). The contract was carried out by BBN of Cambridge, MA under Bob Kahn and went online in December 1969. By June 1970, MIT, Harvard, BBN, and Systems Development Corp (SDC) in Santa Monica, Cal. were added. By January 1971, Stanford, MIT’s Lincoln Labs, Carnegie-Mellon, and Case-Western Reserve U were added. In months to come, NASA/Ames, Mitre, Burroughs, RAND, and the U of Illinois plugged in. After that, there were far too many to keep listing here.

The Internet was designed to provide a communications network that would work even if some of the major sites were down. If the most direct route was not available, routers would direct traffic around the network via alternate routes. The early Internet was used by computer experts, engineers, scientists, and librarians. There was nothing friendly about it. There were no home or office personal computers in those days, and anyone who used it, whether a computer professional or an engineer or scientist or librarian, had to learn to use a very complex system.

E-mail was adapted for ARPANET by Ray Tomlinson of BBN in 1972. He picked the @ symbol from the available symbols on his teletype to link the username and address. The telnet protocol, enabling logging on to a remote
computer, was published as a Request for Comments (RFC) in 1972. RFC's are a means of sharing developmental work throughout community. The ftp protocol, enabling file transfers between Internet sites, was published as an RFC in 1973, and from then on RFC's were available electronically to anyone who had use of the ftp protocol.

Libraries began automating and networking their catalogs in the late 1960s independent from ARPA. The visionary Frederick G. Kilgour of the Ohio College Library Center (now OCLC, Inc.) led networking of Ohio libraries during the '60s and '70s. In the mid 1970s more regional consortia from New England, the Southwest states, and the Middle Atlantic states, etc., joined with Ohio to form a national, later international, network. Automated catalogs, not very user-friendly at first, became available to the world, first through telnet or the awkward IBM variant TN3270 and only many years later, through the web.

The Internet matured in the 70's as a result of the TCP/IP architecture first proposed by Bob Kahn at BBN and further developed by Kahn and Vint Cerf at Stanford and others throughout the 70's. It was adopted by the Defense Department in 1980 replacing the earlier Network Control Protocol (NCP) and universally adopted by 1983. The Unix to Unix Copy Protocol (UUCP) was invented in 1978 at Bell Labs. Usenet was started in 1979 based on UUCP. Newsgroups, which are discussion groups focusing on a topic, followed, providing a means of exchanging information throughout the world. While Usenet is not considered as part of the Internet, since it does not share the use of TCP/IP, it linked unix systems around the world, and many Internet sites took advantage of the availability of newsgroups. It was a significant part of the community building that took place on the networks.

Similarly, BITNET (Because It's Time Network) connected IBM mainframes around the educational community and the world to provide mail services beginning in 1981. Listserv software was developed for this network and later others. Gateways were developed to connect BITNET with the Internet and allowed exchange of e-mail, particularly for e-mail discussion lists. These listservs and other forms of e-mail discussion lists formed another major element in the community building that was taking place. In 1986, the National Science Foundation funded NSFNet as a cross country 56 Kbps backbone for the Internet. They maintained their sponsorship for nearly a decade, setting rules for its non-commercial government and research uses.

As the commands for e-mail, FTP, and telnet were standardized, it became a lot easier for non-technical people to learn to use the nets. It was not easy by today's standards by any means, but it did open up use of the Internet to
many more people in universities in particular. Other departments besides the libraries, computer, physics, and engineering departments found ways to make good use of the nets—to communicate with colleagues around the world and to share files and resources.

While the number of sites on the Internet was small, it was fairly easy to keep track of the resources of interest that were available. But as more and more universities and organizations—and their libraries—connected, the Internet became harder and harder to track. There was more and more need for tools to index the resources that were available.

The first effort, other than library catalogs, to index the Internet was created in 1989, as Peter Deutsch and Alan Emtage, students at McGill University in Montreal, created an archiver for ftp sites, which they named Archie. This software would periodically reach out to all known openly available ftp sites, list their files, and build a searchable index of the software. The commands to search Archie were unix commands, and it took some knowledge of unix to use it to its full capability.

At about the same time, Brewster Kahle, then at Thinking Machines, Corp. developed his Wide Area Information Server (WAIS), which would index the full text of files in a database and allow searches of the files. There were several versions with varying degrees of complexity and capability developed, but the simplest of these were made available to everyone on the nets. At its peak, Thinking Machines maintained pointers to over 600 databases around the world which had been indexed by WAIS. They included such things as the full set of Usenet Frequently Asked Questions files, the full documentation of working papers such as RFC's by those developing the Internet's standards, and much more. Like Archie, its interface was far from intuitive, and it took some effort to learn to use it well.

Peter Scott of the University of Saskatchewan, recognizing the need to bring together information about all the telnet-accessible library catalogs on the web, as well as other telnet resources, brought out his Hytelnet catalog in 1990. It gave a single place to get information about library catalogs and other telnet resources and how to use them. He maintained it for years, and added HyWebCat in 1997 to provide information on web-based catalogs.

In 1991, the first really friendly interface to the Internet was developed at the University of Minnesota. The University wanted to develop a simple menu system to access files and information on campus through their local network. A debate followed between mainframe adherents and those who believed in smaller systems with client-server architecture. The mainframe adherents "won" the
debate initially, but since the client-server advocates said they could put up a prototype very quickly, they were given the go-ahead to do a demonstration system. The demonstration system was called a gopher after the U of Minnesota mascot—the golden gopher. The gopher proved to be very prolific, and within a few years there were over 10,000 gophers around the world. It takes no knowledge of unix or computer architecture to use. In a gopher system, you type or click on a number to select the menu selection you want.

Gopher’s usability was enhanced much more when the University of Nevada at Reno developed the VERONICA searchable index of gopher menus. It was purported to be an acronym for Very Easy Rodent-Oriented Netwide Index to Computerized Archives. A spider crawled gopher menus around the world, collecting links and retrieving them for the index. It was so popular that it was very hard to connect to, even though a number of other VERONICA sites were developed to ease the load. Similar indexing software was developed for single sites, called JUGHEAD (Jonzy’s Universal Gopher Hierarchy Excavation And Display).

In 1989 another significant event took place in making the nets easier to use. Tim Berners-Lee and others at the European Laboratory for Particle Physics, more popularly known as CERN, proposed a new protocol for information distribution. This protocol, which became the World Wide Web in 1991, was based on hypertext—a system of embedding links in text to link to other text, which you have been using every time you selected a text link while reading these pages. Although started before gopher, it was slower to develop.

The development in 1993 of the graphical browser Mosaic by Marc Andreessen and his team at the National Center For Supercomputing Applications (NCSA) gave the protocol its big boost. Later, Andreessen moved to become the brains behind Netscape Corp., which produced the most successful graphical type of browser and server until Microsoft declared war and developed its MicroSoft Internet Explorer.

Since the Internet was initially funded by the government, it was originally limited to research, education, and government uses. Commercial uses were prohibited unless they directly served the goals of research and education. This policy continued until the early 90's, when independent commercial networks began to grow. It then became possible to route traffic across the country from one commercial site to another without passing through the government funded NSFNet Internet backbone.

Delphi was the first national commercial online service to offer Internet access to its subscribers. It opened up an email connection in July 1992 and full
Internet service in November 1992. All pretenses of limitations on commercial use disappeared in May 1995 when the National Science Foundation ended its sponsorship of the Internet backbone, and all traffic relied on commercial networks. AOL, Prodigy, and CompuServe came online. Since commercial usage was so widespread by this time and educational institutions had been paying their own way for some time, the loss of NSF funding had no appreciable effect on costs. Today, NSF funding has moved beyond supporting the backbone and higher educational institutions to building the K-12 and local public library accesses on the one hand, and the research on the massive high volume connections on the other.

Microsoft's full scale entry into the browser, server, and Internet Service Provider market completed the major shift over to a commercially based Internet. The release of Windows 98 in June 1998 with the Microsoft browser well integrated into the desktop shows Bill Gates' determination to capitalize on the enormous growth of the Internet. Microsoft's success over the past few years has brought court challenges to their dominance. We'll leave it up to you whether you think these battles should be played out in the courts or the marketplace.

During this period of enormous growth, businesses entering the Internet arena scrambled to find economic models that work. Free services supported by advertising shifted some of the direct costs away from the consumer—temporarily. Services such as Delphi offered free web pages, chat rooms, and message boards for community building. Online sales have grown rapidly for such products as books and music CDs and computers, but the profit margins are slim when price comparisons are so easy, and public trust in online security is still shaky. Business models that have worked well are portal sites that try to provide everything for everybody, and live auctions. AOL's acquisition of Time-Warner was the largest merger in history when it took place and shows the enormous growth of Internet business! The stock market has had a rocky ride, swooping up and down as the new technology companies, the dot.com's encountered good news and bad. The decline in advertising income spelled doom for many dot.coms, and a major shakeout and search for better business models took place by the survivors.

A current trend with major implications for the future is the growth of high speed connections. 56K modems and the providers who supported them spread widely for a while, but this is the low end now. 56K is not fast enough to carry multimedia, such as sound and video except in low quality. But new technologies many times faster, such as cablemodems and digital subscriber lines (DSL) are predominant now. Wireless has grown rapidly in the past few
years, and travellers search for the wi-fi "hot spots" where they can connect while they are away from the home or office. Many airports, coffee bars, hotels and motels now routinely provide these services, some for a fee and some for free.

A next big growth area is the surge towards universal wireless access, where almost everywhere is a "hot spot". Municipal wi-fi or city-wide access, wiMAX offering broader ranges than wi-fi, EV-DO, 4g, and other formats will joust for dominance in the USA in the years ahead. The battle is both economic and political. Another trend that is rapidly affecting web designers is the growth of smaller devices to connect to the Internet. Small tablets, pocket PCs, smart phones, ebooks, game machines, and even GPS devices are now capable of tapping into the web on the go, and many web pages are not designed to work on that scale.

As the Internet has become ubiquitous, faster, and increasingly accessible to non-technical communities, social networking and collaborative services have grown rapidly, enabling people to communicate and share interests in many more ways. Sites like Facebook, Twitter, Linked-In, YouTube, Flickr, Second Life, delicious, blogs, wikis, and many more let people of all ages rapidly share their interests of the moment with others everywhere.

INTERNET ACCESS METHODS

Dial-up Internet access

Dial-up Internet access is a form of Internet access that uses the facilities of the public switched telephone network (PSTN) to establish a dialed connection to an Internet service provider (ISP) via telephone lines. The user's computer or router uses an attached modem to encode and decode Internet Protocol packets and control information into and from analogue audio frequency signals, respectively.

Availability

Dial-up connections to the Internet require no infrastructure other than the telephone network. Where telephone access is widely available, dial-up remains useful and it is often the only choice available for rural or remote areas, where broadband installations are not prevalent due to low population density, and high infrastructure cost. Dial-up access may also be an alternative for users on limited budgets, as it is offered free by some ISPs, though broadband is increasingly available at lower prices in many countries due to market competition.

Dial-up requires time to establish a telephone connection (up to several seconds, depending on the location) and perform handshaking for protocol
synchronization before data transfers can take place. In locales with telephone connection charges, each connection incurs an incremental cost. If calls are time-metered, the duration of the connection incurs costs.

    Dial-up access is a transient connection, because either the user, ISP or phone company terminates the connection. Internet service providers will often set a limit on connection durations to allow sharing of resources, and will disconnect the user—requiring reconnection and the costs and delays associated with it. Technically-inclined users often find a way to disable the auto-disconnect program such that they can remain connected for days.

    A 2008 Pew Internet and American Life Project study states that only 10 percent of US adults still used dial-up Internet access. Reasons for retaining dial-up access include lack of infrastructure and high broadband prices. According to the United States Federal Communications Commission (FCC), 6% used dial-up in 2010.

    **Replacement by broadband**

    Broadband Internet access (cable and DSL) has been replacing dial-up access in many parts of the world. Broadband connections typically offer speeds 700 kbit/s or higher for approximately the same price as dial-up. However, many areas still remain without high speed Internet despite the eagerness of potential customers. This can be attributed to population, location, or sometimes ISPs' lack of interest due to little chance of profitability and high costs to build the required infrastructure. Some dial-up ISPs have responded to the increased competition by lowering their rates and making dial-up an attractive option for those who merely want email access or basic web browsing.

    **Recession and its effect on service**

    News reports in 2009 noted a resurgence of dial-up access in the U.S. resulting from a recessionary economy, as a more affordable way of accessing the Internet. AOL added 200,000 dial-up customers in 2011. The average monthly price of dial-up Internet is $22, compared to $37 for broadband, according to the FCC.

    Certainly high-speed DSL and Cable are available without local phone service, but the cost of this "naked" service is noticeably higher. AT&T offers basic DSL ("Direct Express") without a phone line for $24.95/month, potentially negating any savings from canceling the phone service. Cable companies do not financially penalize a subscriber for not having a local phone; however cable Internet services are usually more expensive if the customer does not subscribe to their television services.
Social networking sites such as Facebook and Twitter feature mobile editions with limited graphics and reduced functionality, designed for slow Internet connections on mobile devices. These cut-down websites will also perform well on a PC or netbook with a dial-up connection, making modern social networking possible through traditional dial-up Internet access. The affordability of dial-up Internet (and low-end PCs such as netbooks) makes this one viable option for social networking in a recessionary economy.

**Performance**

Modern dial-up modems typically have a maximum theoretical transfer speed of 56 kbit/s (using the V.90 or V.92 protocol), although in most cases 40–50 kbit/s is the norm. Factors such as phone line noise as well as the quality of the modem itself play a large part in determining connection speeds. Some connections may be as low as 20 kbit/s in extremely "noisy" environments, such as in a hotel room where the phone line is shared with many extensions, or in a rural area, many miles from the phone exchange. Other things such as long loops, loading coils, pair gain, electric fences (usually in rural locations), and digital loop carriers can also cripple connections to 20 kbit/s or lower.

Dial-up connections usually have latency as high as 300 ms or even more; this is longer than for many forms of broadband, such as cable or DSL, but typically less than satellite connections. Longer latency can make online gaming or video conferencing difficult, if not impossible. First-person shooter style games are the most sensitive to latency, making playing them impractical on dial-up.

Many modern video games do not even include the option to use dial-up. However, some games such as Everquest, Red Faction, Star Wars: Galaxies, Warcraft 3, Final Fantasy XI, Phantasy Star Online, Guild Wars, Unreal Tournament, Halo: Combat Evolved, Audition, Quake 3: Arena, and Ragnarok Online, are capable of running on 56k dial-up.

An increasing amount of Internet content such as streaming media will not work at dial-up speeds. Analog telephone lines are digitally switched and transported inside a Digital Signal 0 once reaching the telephone company's equipment. Digital Signal 0 is 64 kbit/s; therefore a 56 kbit/s connection is the highest that will ever be possible with analog phone lines.

**Using compression to exceed 56k**

The V.42, V.42bis and V.44 standards allow modems to accept uncompressed data at a rate faster than the line rate. These algorithms use data compression to achieve higher throughput. For instance, a 53.3 kbit/s connection
with V.44 can transmit up to $53.3 \times 6 = 320 \text{ kbit/s}$ if the offered data stream can be compressed that much. However, the compressibility of data tends to vary continuously, for example, due to the transfer of already-compressed files (ZIP files, JPEG images, MP3 audio, MPEG video). A modem might be sending compressed files at approximately 50 kbit/s, uncompressed files at 160 kbit/s, and pure text at 320 kbit/s, or any rate in this range.

**Compression by the ISP**

As telephone-based 56 kbit/s modems began losing popularity, some Internet Service Providers such as TurboUSA, Netzero, CdotFree, TOAST.net, and Earthlink started using pre-compression to increase the throughput and maintain their customer base. As an example, Netscape ISP uses a compression program that squeezes images, text, and other objects at a proxy server, just prior to sending them across the phone line.

The server-side compression operates much more efficiently than the "on-the-fly" compression of V.44-enabled modems. Typically website text is compacted to 5% thus increasing effective throughput to approximately 1000 kbit/s, and images are lossy-compressed to 15-20% increasing throughput to about 350 kbit/s.

The drawback of this approach is a loss in quality, where the graphics acquire more compression artifacts taking on a blurry appearance; however, the perceived speed is dramatically improved and the user can manually choose to view the uncompressed images at any time. ISPs employing this approach may advertise it as "DSL speeds over regular phone lines" or simply "high speed dial-up".

**Digital subscriber line (DSL)**

**Digital subscriber line** (DSL, originally digital subscriber loop) is a family of technologies that provide internet access by transmitting digital data over the wires of a local telephone network. In telecommunications marketing, the term DSL is widely understood to mean Asymmetric Digital Subscriber Line (ADSL), the most commonly installed DSL technology. DSL service is delivered simultaneously with wired telephone service on the same telephone line. This is possible because DSL uses higher frequency bands for data separated by filtering. On the customer premises, a DSL filter on each outlet removes the high frequency interference, to enable simultaneous use of the telephone and data.

The data bit rate of consumer DSL services typically ranges from 256 kbit/s to 40 Mbit/s in the direction to the customer (downstream), depending on
DSL technology, line conditions, and service-level implementation. In ADSL, the data throughput in the upstream direction, (the direction to the service provider) is lower, hence the designation of asymmetric service. In Symmetric Digital Subscriber Line (SDSL) services, the downstream and upstream data rates are equal.

Theory behind DSL, like many other forms of communication, can be traced back to Claude Shannon’s seminal 1948 paper: A Mathematical Theory of Communication. An early patent was filed in 1987 for the use of wires for both voice phones and as a local area network. The motivation of digital subscriber line technology was the Integrated Services Digital Network (ISDN) specification proposed in 1984 by the CCITT (now ITU-T) as part of Recommendation I.120, later reused as ISDN Digital Subscriber Line (IDSL). Employees at Bellcore (now Telcordia Technologies) developed Asymmetric Digital Subscriber Line (ADSL) and filed a patent in 1988 by placing wide-band digital signals above the existing baseband analog voice signal carried between telephone company telephone exchanges and customers on conventional twisted pair cabling facilities. Consumer-oriented ADSL was designed to operate on existing lines already conditioned for BRI ISDN services, which itself is a switched digital service (non-IP), though most incumbent local exchange carriers (ILECs) provision Rate-Adaptive Digital Subscriber Line (RADSL) to work on virtually any available copper pair facility—whether conditioned for BRI or not. Engineers developed higher-speed DSL facilities such as High bit rate Digital Subscriber Line (HDSL) and Symmetric Digital Subscriber Line (SDSL) to provision traditional Digital Signal 1 (DS1) services over standard copper pair facilities.

A DSL circuit provides digital service. The underlying technology of transport across DSL facilities uses high-frequency sinusoidal carrier wave modulation, which is an analog signal transmission. A DSL circuit terminates at each end in a modem which modulates patterns of bits into certain high-frequency impulses for transmission to the opposing modem. Signals received from the far-end modem are demodulated to yield a corresponding bit pattern that the modem retransmits, in digital form, to its interfaced equipment, such as a computer, router, switch, etc. Unlike traditional dial-up modems, which modulate bits into signals in the 300–3400 Hz baseband (voice service), DSL modems modulate frequencies from 4000 Hz to as high as 4 MHz. This frequency band separation enables DSL service and plain old telephone service (POTS) to coexist on the same copper pair facility. Generally, higher bit rate transmissions require a wider frequency band, though the ratio of bit rate to bandwidth are not linear due to significant innovations in digital signal processing and digital modulation methods.
Early DSL service required a dedicated dry loop, but when the U.S. Federal Communications Commission (FCC) required ILECs to lease their lines to competing DSL service providers, shared-line DSL became available. Also known as DSL over Unbundled Network Element, this unbundling of services allows a single subscriber to receive two separate services from two separate providers on one cable pair. The DSL service provider's equipment is collocated in the same central office (telephone exchange) as that of the ILEC supplying the customer's pre-existing voice service. The subscriber's circuit is then rewired to interface with hardware supplied by the ILEC which combines a DSL frequency and POTS frequency on a single copper pair facility.

On the subscriber's end of the circuit, inline low-pass DSL filters (splitters) are installed on each telephone to filter the high-frequency "hiss" that would otherwise be heard, but pass voice (5 kHz and below) frequencies. Conversely, high-pass filters already incorporated in the circuitry of DSL modems filter out voice frequencies. Although ADSL and RADSL modulations do not use the voice-frequency band, nonlinear elements in the phone could otherwise generate audible intermodulation and may impair the operation of the data modem in the absence of low-pass filters.

Older ADSL standards delivered 8 Mbit/s to the customer over about 2 km (1.2 mi) of unshielded twisted-pair copper wire. Newer variants improved these rates. Distances greater than 2 km (1.2 mi) significantly reduce the bandwidth usable on the wires, thus reducing the data rate. ADSL loop extenders increase these distances substantially.

**Operation.**

**Basic technology**

Telephones are connected to the telephone exchange via a local loop, which is a physical pair of wires. Prior to the digital age, the use of the local loop for anything other than the transmission of speech, encompassing an audio frequency range of 300 to 3400 Hertz (voiceband or commercial bandwidth) was not considered. However, as long distance trunks were gradually converted from analog to digital operation, the idea of being able to pass data through the local loop (by utilizing frequencies above the voiceband) took hold, ultimately leading to DSL.

For a long time it was thought that it was not possible to operate a conventional phone-line beyond low-speed limits (typically less than 9600 bit/s). In the 1950s, ordinary twisted-pair telephone-cable often carried four megahertz (MHz) television signals between studios, suggesting that such lines would allow
transmitting many megabits per second. One such circuit in the UK ran some ten miles (16 km) between Pontop Pike transmitter and Newcastle upon Tyne BBC Studios. It was able to give the studios a low quality cue feed but not one suitable for transmission. However, these cables had other impairments besides Gaussian noise, preventing such rates from becoming practical in the field. The 1980s saw the development of techniques for broadband communications that allowed the limit to be greatly extended.

The local loop connecting the telephone exchange to most subscribers has the capability of carrying frequencies well beyond the 3.4 kHz upper limit of POTS. Depending on the length and quality of the loop, the upper limit can be tens of megahertz. DSL takes advantage of this unused bandwidth of the local loop by creating 4312.5 Hz wide channels starting between 10 and 100 kHz, depending on how the system is configured. Allocation of channels continues at higher and higher frequencies (up to 1.1 MHz for ADSL) until new channels are deemed unusable. Each channel is evaluated for usability in much the same way an analog modem would on a POTS connection. More usable channels equates to more available bandwidth, which is why distance and line quality are a factor (the higher frequencies used by DSL travel only short distances). The pool of usable channels is then split into two different frequency bands for upstream and downstream traffic, based on a preconfigured ratio. This segregation reduces interference. Once the channel groups have been established, the individual channels are bonded into a pair of virtual circuits, one in each direction. Like analog modems, DSL transceivers constantly monitor the quality of each channel and will add or remove them from service depending on whether they are usable.

One of Lechleider’s contributions to DSL was his insight that an asymmetric arrangement offered more than double the bandwidth capacity of symmetric DSL. This allowed Internet Service Providers to offer efficient service to consumers, who benefited greatly from the ability to download large amounts of data but rarely needed to upload comparable amounts. ADSL supports two modes of transport: fast channel and interleaved channel. Fast channel is preferred for streaming multimedia, where an occasional dropped bit is acceptable, but lags are less so. Interleaved channel works better for file transfers, where the delivered data must be error free but latency incurred by the retransmission of errored packets is acceptable.

Because DSL operates above the 3.4 kHz voice limit, it cannot pass through a load coil. Load coils are, in essence, filters that block out any non-voice frequency. They are commonly set at regular intervals in lines placed only for POTS service. A DSL signal cannot pass through a properly installed and
working load coil, while voice service cannot be maintained past a certain distance without such coils. Therefore, some areas that are within range for DSL service are disqualified from eligibility because of load coil placement. Because of this, phone companies endeavor to remove load coils on copper loops that can operate without them, and conditioning lines to avoid them through the use of fiber to the neighborhood or node (FTTN).

The commercial success of DSL and similar technologies largely reflects the advances made in electronics over the decades that have increased performance and reduced costs even while digging trenches in the ground for new cables (copper or fiber optic) remains expensive. Several factors contributed to the popularity of DSL technology:

- Until the late 1990s, the cost of digital signal processors for DSL was prohibitive. All types of DSL employ highly complex digital signal processing algorithms to overcome the inherent limitations of the existing twisted pair wires. Due to the advancements of Very-large-scale integration (VLSI) technology, the cost of the equipment associated with a DSL deployment lowered significantly. The two main pieces of equipment are a Digital subscriber line access multiplexer (DSLAM) at one end and a DSL modem at the other end.

- A DSL connection can be deployed over existing cable. Such deployment, even including equipment, is much cheaper than installing a new, high-bandwidth fiber-optic cable over the same route and distance. This is true both for ADSL and SDSL variations.

- In the case of ADSL, competition in Internet access caused subscription fees to drop significantly over the years, thus making ADSL more economical than dial up access. Telephone companies were pressured into moving to ADSL largely due to competition from cable companies, which use DOCSIS cable modem technology to achieve similar speeds. Demand for high bandwidth applications, such as video and file sharing, also contributed to popularize ADSL technology.

Most residential and small-office DSL implementations reserve low frequencies for POTS service, so that (with suitable filters and/or splitters) the existing voice service continues to operate independent of the DSL service. Thus POTS-based communications, including fax machines and analog modems, can share the wires with DSL. Only one DSL "modem" can use the subscriber line at a time. The standard way to let multiple computers share a DSL connection uses a router that establishes a connection between the DSL modem and a local Ethernet, Powerline, or Wi-Fi network on the customer’s premises.
Once upstream and downstream channels are established, a subscriber can connect to a service such as an Internet service provider.

**Naked DSL**

A naked DSL (a.k.a. standalone or dry loop DSL) is a way of providing DSL services without a PSTN (analogue telephony) service. It is useful when the customer does not need the traditional telephony voice service because voice service is received either on top of the DSL services (usually Voice over IP) or through another network (mobile telephony).

It is also commonly called a "UNE" for Unbundled Network Element, in the USA. It has started making a comeback in the US in 2004 when Qwest started offering it, closely followed by Speakeasy. As a result of AT&T's merger with SBC, and Verizon's merger with MCI, those telephone companies have an obligation to offer naked DSL to consumers.

Even without the regulatory mandate, however, many ILECs offer naked DSL to consumers. The number of telephone landlines in the US dropped from 188 million in 2000 to 115 million in 2010, while the number of cellular subscribers has grown to 277 million (as of 2010). This lack of demand for landline voice service has resulted in the expansion of naked DSL availability. Naked DSL products are also marketed in some other countries e.g. Australia, New Zealand and Canada.

**Typical setup**

On the customer side, the DSL Transceiver, or ATU-R, or more commonly known as a DSL modem, is hooked up to a phone line. The telephone company (telco) connects the other end of the line to a DSLAM, which concentrates a large number of individual DSL connections into a single box. The location of the DSLAM depends on the telco, but it cannot be located too far from the user because of attenuation, the loss of data due to the large amount of electrical resistance encountered as the data moves between the DSLAM and the user's DSL modem. It is common for a few residential blocks to be connected to one DSLAM.

When the DSL modem powers up it goes through a sync procedure. The actual process varies from modem to modem but generally involves the following steps:

1. The DSL transceiver performs a self-test.
2. The DSL transceiver checks the connection between the DSL transceiver and the computer. For residential variations of DSL, this is usually the Ethernet (RJ-45) port or a USB port; in rare models, a FireWire port is
used. Older DSL modems sported a native ATM interface (usually, a 25 Mbit/s serial interface). Also, some variations of DSL (such as SDSL) use synchronous serial connections.

3. The DSL transceiver then attempts to synchronize with the DSLAM. Data can only come into the computer when the DSLAM and the modem are synchronized. The synchronization process is relatively quick (in the range of seconds) but is very complex, involving extensive tests that allow both sides of the connection to optimize the performance according to the characteristics of the line in use. External or stand-alone modem units have an indicator labeled "CD", "DSL", or "LINK", which can be used to tell if the modem is synchronized. During synchronization the light flashes; when synchronized, the light stays lit, usually with a green color.

Modern DSL gateways have more functionality and usually go through an initialization procedure very similar to a PC boot up. The system image is loaded from the flash memory; the system boots synchronizes the DSL connection and establishes the IP connection between the local network and the service provider, using protocols such as DHCP or PPPoE. The system image can usually be updated to correct bugs, or to add new functionality.

The accompanying figure is a schematic of a simple DSL connection (in blue). The right side shows a DSLAM residing in the telephone company’s central office. The left side shows the customer premises equipment with an optional router. This router manages a local area network (LAN) off of which are connected some number of PCs. With many service providers, the customer may opt for a modem which contains a wireless router. This option (within the dashed bubble) often simplifies the connection.

**Exchange equipment**

At the exchange, a digital subscriber line access multiplexer (DSLAM) terminates the DSL circuits and aggregates them, where they are handed off onto other networking transports. In the case of ADSL, the voice component is also separated at this step, either by a filter integrated in the DSLAM or by specialized filtering equipment installed before it. The DSLAM terminates all connections and recovers the original digital information.

**Customer equipment**

The customer end of the connection consists of a terminal adaptor or "DSL modem". This converts data between the digital signals used by computers and the voltage signal of a suitable frequency range which is then applied to the phone line.
**DSL Modem schematic**

In some DSL variations (for example, HDSL), the terminal adapter connects directly to the computer via a serial interface, using protocols such as ethernet or V.35. In other cases (particularly ADSL), it is common for the customer equipment to be integrated with higher level functionality, such as routing, firewalls, or other application-specific hardware and software. In this case, the equipment is referred to as a gateway.

Most DSL technologies require installation of appropriate filters to separate, or "split", the DSL signal from the low frequency voice signal. The separation can take place either at the demarcation point, or with filters installed at the telephone outlets inside the customer premises. Either way has its practical and economical limitations.

**Protocols and configurations**

Many DSL technologies implement an Asynchronous Transfer Mode (ATM) layer over the low-level bitstream layer to enable the adaptation of a number of different technologies over the same link.

DSL implementations may create bridged or routed networks. In a bridged configuration, the group of subscriber computers effectively connects into a single subnet. The earliest implementations used DHCP to provide network details such as the IP address to the subscriber equipment, with authentication via MAC address or an assigned host name. Later implementations often use Point-to-Point Protocol (PPP) or Asynchronous Transfer Mode (ATM) (Point-to-Point Protocol over Ethernet (PPPoE) or Point-to-Point Protocol over ATM (PPPoA)), while authenticating with a userid and password and using Point-to-Point Protocol (PPP) mechanisms to provide network details.

**Transmission methods**

Transmission methods vary by market, region, carrier, and equipment:
2B1Q: Two-binary, one-quaternary, used for IDSL and HDSL

CAP: Carrierless Amplitude Phase Modulation - deprecated in 1996 for ADSL, used for HDSL

TC-PAM: Trellis Coded Pulse Amplitude Modulation, used for HDSL2 and SHDSL

DMT: Discrete multitone modulation, the most numerous kind, also known as OFDM (Orthogonal frequency-division multiplexing)

DSL technologies

The line-length limitations from telephone exchange to subscriber impose more restrictions on higher data-transmission rates. Technologies such as VDSL provide very high speed, short-range links as a method of delivering "triple play" services (typically implemented in fiber to the curb network architectures). Technologies like GDSL can further increase the data rate of DSL. Fiber Optic technologies exist today that allow the conversion of copper based ISDN, ADSL and DSL over fiber optics.

Cable

A cable is most often two or more wires running side by side and bonded, twisted or braided together to form a single assembly, but can also refer to a heavy strong rope. In mechanics cables, otherwise known as wire ropes, are used for lifting, hauling and towing or conveying force through tension. In electrical engineering cables are used to carry electric currents. An optical cable contains one or more optical fibers in a protective jacket that supports the fibers. Electric cables discussed here are mainly meant for installation in buildings and industrial sites. For power transmission at distances greater than a few kilometres see high-voltage cable, power cables and HVDC.

Ropes made of multiple strands of natural fibers such as hemp, sisal, manila, and cotton have been used for millennia for hoisting and hauling. By the 19th century, deepening of mines and construction of large ships increased demand for stronger cables. Invention of improved steelmaking techniques made high-quality steel available at lower cost, and so wire ropes became common in mining and other industrial applications. By the middle of the 19th century, manufacture of large submarine telegraph cables was done using machines similar to those used for manufacture of mechanical cables.

In the 19th century and early 20th century, electrical cable was often insulated using cloth, rubber and paper. Plastic materials are generally used today, except for high-reliability power cables.
Electrical cables

Electrical cables may be made more flexible by stranding the wires. In this process, smaller individual wires are twisted or braided together to produce larger wires that are more flexible than solid wires of similar size. Bunching small wires before concentric stranding adds the most flexibility. Copper wires in a cable may be bare, or they may be plated with a thin layer of another metal, most often tin but sometimes gold, silver or some other material. Tin, gold, and silver are much less prone to oxidation than copper, which may lengthen wire life, and makes soldering easier. Tinning is also used to provide lubrication between strands. Tinning was used to help removal of rubber insulation. Tight lays during stranding makes the cable extensible (CBA - as in telephone handset cords).

Cables can be securely fastened and organized, such as by using trunking, cable trays, cable ties or cable lacing. Continuous-flex or flexible cables used in moving applications within cable carriers can be secured using strain relief devices or cable ties.

At high frequencies, current tends to run along the surface of the conductor. This is known as the skin effect.

Cables and electromagnetic fields

Coaxial cable.

Twisted pair cabling

Any current-carrying conductor, including a cable, radiates an electromagnetic field. Likewise, any conductor or cable will pick up energy from any existing electromagnetic field around it. These effects are often undesirable, in the first case amounting to unwanted transmission of energy which may adversely affect nearby equipment or other parts of the same piece of equipment; and in the second case, unwanted pickup of noise which may mask the desired
signal being carried by the cable, or, if the cable is carrying power supply or control voltages, pollute them to such an extent as to cause equipment malfunction.

The first solution to these problems is to keep cable lengths in buildings short, since pick up and transmissions are essentially proportional to the length of the cable. The second solution is to route cables away from trouble. Beyond this, there are particular cable designs that minimize electromagnetic pickup and transmission. Three of the principal design techniques are shielding, coaxial geometry, and twisted-pair geometry.

Shielding makes use of the electrical principle of the Faraday cage. The cable is encased for its entire length in foil or wire mesh. All wires running inside this shielding layer will be to a large extent decoupled from external electric fields, particularly if the shield is connected to a point of constant voltage, such as earth. Simple shielding of this type is not greatly effective against low-frequency magnetic fields, however - such as magnetic "hum" from a nearby power transformer. A grounded shield on cables operating at 2.5 kV or more gathers leakage current and capacitive current, protecting people from electric shock and equalizing stress on the cable insulation.

Coaxial design helps to further reduce low-frequency magnetic transmission and pickup. In this design the foil or mesh shield has a circular cross section and the inner conductor is exactly at its center. This causes the voltages induced by a magnetic field between the shield and the core conductor to consist of two nearly equal magnitudes which cancel each other.

A twisted pair has two wires of a cable twisted around each other. This can be demonstrated by putting one end of a pair of wires in a hand drill and turning while maintaining moderate tension on the line. Where the interfering signal has a wave length that is long compared to the pitch of the twisted pair, alternate lengths of wires develop opposing voltages, tending to cancel the effect of the interference.

Fire protection

In building construction, electrical cable jacket material is a potential source of fuel for fires. To limit the spread of fire along cable jacketing, one may use cable coating materials or one may use cables with jacketing that is inherently fire retardant. The plastic covering on some metal clad cables may be stripped off at installation to reduce the fuel source for fires. Inorganic coatings and boxes around cables safeguard the adjacent areas from the fire threat associated with unprotected cable jacketing. However, this fire protection also
traps heat generated from conductor losses, so the protection must be thin.

There are two methods of providing fire protection to a cable:
1. Insulation material is deliberately added with fire retardant materials
2. The copper conductor itself is covered with mineral insulation (MICC cables)

**Integrated Services Digital Network (ISDN)**

Integrated Services Digital Network is a set of communications standards for simultaneous digital transmission of voice, video, data, and other network services over the traditional circuits of the public switched telephone network. It was first defined in 1988 in the CCITT red book. Prior to ISDN, the telephone system was viewed as a way to transport voice, with some special services available for data. The key feature of ISDN is that it integrates speech and data on the same lines, adding features that were not available in the classic telephone system. There are several kinds of access interfaces to ISDN defined as Basic Rate Interface (BRI), Primary Rate Interface (PRI) and Broadband ISDN (B-ISDN).

ISDN is a circuit-switched telephone network system, which also provides access to packet switched networks, designed to allow digital transmission of voice and data over ordinary telephone copper wires, resulting in potentially better voice quality than an analog phone can provide. It offers circuit-switched connections (for either voice or data), and packet-switched connections (for data), in increments of 64 kilobit/s. A major market application for ISDN in some countries is Internet access, where ISDN typically provides a maximum of 128 kbit/s in both upstream and downstream directions. Channel bonding can achieve a greater data rate; typically the ISDN B-channels of 3 or 4 BRIs (6 to 8 64 kbit/s channels) are bonded.

ISDN should not be mistaken for its use with a specific protocol, such as Q.931 whereby ISDN is employed as the network, data-link and physical layers in the context of the OSI model. In a broad sense ISDN can be considered a suite of digital services existing on layers 1, 2, and 3 of the OSI model. ISDN is designed to provide access to voice and data services simultaneously.

However, common use reduced ISDN to be limited to Q.931 and related protocols, which are a set of protocols for establishing and breaking circuit switched connections, and for advanced calling features for the user. They were introduced in 1986. In a videoconference, ISDN provides simultaneous voice, video, and text transmission between individual desktop videoconferencing systems and group (room) videoconferencing systems.
WiFi

WiFi, also spelled Wi-Fi, is a wireless networking technology used across the globe. It refers to any system that uses the 802.11 standard, which was developed by the Institute of Electrical and Electronics Engineers (IEEE) and released in 1997. This standard was largely promoted by the Wi-Fi Alliance, a trade group that pioneered commercialization of the technology. A person or business can use a wireless router or similar device to create a “hotspot” or area in which appropriate devices can connect wirelessly to a network or gain Internet access.

Basic Setup

In a WiFi network, computers with appropriate network cards can connect wirelessly to a proper router. This router is usually connected to the Internet by means of a modem, often one featuring a high-speed connection. Any user within 200 feet or so (about 61 meters) of the access point can then connect to the Internet, though for good transfer rates, distances of 100 feet (around 30.5 meters) or less are often suggested. Retailers also sell signal boosters that extend the range of a wireless network.

Types of Networks

WiFi networks can either be "open," so that anyone can use them, or "closed," in which case a password is needed. An area blanketed in wireless access through a device is often called a "wireless hotspot." Anyone with a device that includes appropriate functionality can connect to this network while in the hotspot. Through this connection, a local network can be accessed or Internet connectivity can be achieved. This allows people within the hotspot to connect to the Internet via the router and modem, often provided for employees at a business or as a complimentary service at coffee shops and similar locations.

Large Hotspots

There are efforts underway to turn entire cities, such as San Francisco, Portland, and Philadelphia, into big WiFi hotspots. Many of these plans could offer free, ad-supported service or ad-free service for a small fee to anyone within the city. Such efforts require a great deal of infrastructure planning and support, though they would grant unparalleled connectivity for residents of those cities.

How It Works

WiFi technology uses radio signals for communication, typically operating at a frequency of 2.4 gigahertz (GHz). Electronics that are "WiFi Certified" are guaranteed to interoperate with each other regardless of brand, as long as they
use the same version of the technology. Companies designed this standard to cater to lightweight computing systems, which are typically mobile and designed to consume minimal power. Hardware developers produce mobile phones, laptops, and tablet computers that are all compatible with this wireless technology. Desktop computers can typically connect to such a network through the installation of a wireless card or dongle.

**Different Types**

Different versions of the 802.11 standard have been released over the years, often indicated by a letter following the designation. Wireless-G, for example, introduced numerous improvements over the initial standard such as higher transfer rates. It is important for a computer or device user to recognize what type of WiFi their device uses, to ensure compatibility with the router creating a hotspot. As the technology continues to improve, additional designations are likely to be released, though they are often backwards compatible with earlier versions.

**Internet as a knowledge Repository**

The Internet has been acknowledged to be an extraordinary tool to handle and distribute information. Already, corporations from General Electric to Manpower Inc. are looking at ways to channel the internet’s vast resources to cut costs, build profit, spot market trends early, swap manufacturing tips with customers and suppliers, and speed new products to market. The usage of the Internet in knowledge management systems further scales up the utility of this systems. As pointed out in the beginning; firstly, the Internet eliminates geographical space as a constraint for these systems. Secondly, due to its information handling capacity, it greatly decreases the search costs for information. Thirdly, it provides the linkage between various levels of knowledge creation in the knowledge value chain and captures the knowledge created among the various stake holders of the firm – such as management, customers, employees, government and social institutions.

**IMPORTANCE OF CRITICAL THINKING FOR STUDENT USE OF THE INTERNET**

Students are increasingly so dependent on the Internet for their information that critical thinking programs that do not address the form and quality of persuasion on that medium are flirting with an anachronistic pedagogy. Here we document the absorption of post secondary students with the Internet as a source of “knowledge”, spells out the attendant dangers, and suggests the essential first step in applying critical thinking to the Internet.
Critical thinking is the systematic evaluation of the arguments of others. In a world where arguments and counterarguments flourish with respect to almost all social questions, students have a fundamental need for the development of attitudes and skills that permit them to negotiate the inescapable dissensus that surrounds them.

Increasing Dependence of Students on Computers as a Source for their Conclusions. The vastness of the Internet has something for everyone. We use it to communicate, to play, to work. As the Internet becomes ubiquitous on college campuses, students are finding more and more ways to use computer technology. Because the Internet has its roots in universities as well as in business, it is not surprising that more and more students are conducting academic research on-line. Increasingly upon announcing a research paper assignment, educators are faced with the question of whether students can use the Web for their research. Are these students asking simply out of curiosity? Will the Internet be a last resort in their searches for information? Probably not, according to recent studies.

Increased use of the Internet, like that of most technology, can be considered either positively or negatively. Most educators agree that the Internet can be a valuable resource if used correctly. Yet some educators have observed that their students are not using the Internet carefully enough. David Rothenberg, an associate professor at the New Jersey Institute of Technology, bemoans the increasing difficulty of identifying in-depth commentaries within his students’ papers. Instead, he finds that papers arising from information found primarily on the Internet consist of “summaries of summaries” (1997). An article in the New York Times reported that educators are receiving “superficial” research papers from their students, papers replete with data, some of it incorrect, but lacking in careful thought. It seems that at least some students are relying upon the Internet to provide them with ideas and thoughtful conclusions that can be inserted directly into a research paper.

A fair rejoinder would be that there is no paucity of shallow argument in student essays, regardless of their source. But that valid observation misses an important point. At least with most print sources, a process of professional assessment has preceded the eventual publication. Unless we have utter contempt for professional judgment, it is safe to say that, prima facie, print sources have a distinct advantage as a basis for belief. Advantages and Disadvantages of Relying Upon Conclusions Found on the Internet

The Internet has become a way to communicate, a way to conduct business, even a way to shop. While the Internet is often considered as a source
of entertainment, it began primarily as a research and scholarly tool, and it is this academic aspect that is becoming increasingly popular among students. There are several advantages to using the Internet as a research tool. Using the Web can allow students to access information that cannot be readily found in print. In addition, the Internet is convenient: unlike resources housed in a library, the Internet is available all day, every day. Finally, the interactivity of some academic Web sites makes them unparalleled as a resource. To a student able to discern the academic merit of the information he finds, using the Internet may be well worth the extra evaluative effort because of these advantages.

When using the Internet for research, students have access to information from universities, observatories, government agencies and other sources worldwide. The availability of library catalogs on the Web enables students in small and remote institutions to search the collections of larger institutions like Oxford University and the Library of Congress. Up-to-date information from sources ranging from independent researchers to government agencies can be found on the Web, as can otherwise unpublished information. Students using the Internet carefully may find more in-depth information than would be available without such technology. For this reason, the Internet is of great advantage as a research tool.

In addition to the scope of information available on the Internet, the unique convenience afforded by electronic resources is also noteworthy. While most students are able to complete library research within the library’s normal hours of operation, the Internet offers an advantage to those who cannot. The Internet is “open” at all hours of the night or day, every day of the week, and even on holidays. This convenience presents a definite advantage to students for whom the nearest library’s schedule is a constraint to research.

Not only can students browse the Web at all hours of the day and night, but they also can interact with many of the information sources they find there. The Web is clearly an interactive medium. On sites that advertise products, patrons are often asked to fill out surveys and log their comments on a particular product. Hypertext links found within the text of most Web sites send the researcher to different Web sites or to another location on the same site with the click of a mouse. This interactive quality can be an advantage for two reasons. The first advantage is that most Web sites contain a link to the author’s e-mail address, allowing students to contact that person with questions or requests for further information. Being able to contact the primary source of the information they find on the Internet allows students to determine the genuine authority of the author by engaging in a dialogue with him. Another advantage
enabled by the interactive nature of the Internet is the creation of sites that are “loci for communities of experts and for the ... advancement of knowledge in certain fields.” Such resources evolve from academic sites at which esteemed members of a field post drafts of papers for peer review, discuss experimental findings and share new ideas. For student researchers, such sites are “dynamic and potentially rich” source of information.

It is clear that the Internet offers certain advantages to student researchers. Yet relying heavily upon the Internet for academic purposes makes research seem easy and allows students to confuse information with knowledge. Once this confusion exists, the careful evaluation by which meaningless data evolves into knowledge seems unnecessary. If relying upon the Internet causes students to cease evaluating information with which they are presented, then one of the primary purposes of higher education is jeopardized. “Our institutions’ primary mission is to expand students’ intellectual capacities,” writes Alexander W.Astin, director of the Higher Education Research Institute at the University of California at Los Angeles (1997). Without the acquisition of knowledge transformed from random pieces of information, the intellectual capacity of students of higher education is not being expanded. Therefore, despite the advantages of Internet research, it is arguable that reliance upon the Internet as a source of research poses a threat to one of the fundamental goals of higher education.

The seeming ease of using the Internet makes scholastic research seem similarly effortless; with a few keystrokes and a click of the mouse, students are provided with hundreds of sites from which to draw information on a particular topic. Hypertext links, ubiquitous on most sites, amplify the seeming ease of research by allowing students to quickly cross-reference information and pursue promising leads. However, the ease with which we can find information is not directly proportional to its quality as research. Students may develop a “misunderstanding of research itself” by using the Internet as a research tool, Darnton (1999) claims, due partly to the decontextualized nature of information found electronically. Historical research, for example, involves recognition and appreciation of context; the handwriting, typeface, layout and paper qualities of a document are valuable clues to a document’s meaning. Such contextual clues are unavailable to students who find a document on-line as opposed to in the library archives. In using the Internet to find the majority of research on a topic, students do not learn the importance of information’s context, leading to a very narrow understanding of what careful research requires of the researcher.
The increasing reliance of students on Internet research has also been accompanied by a decline in the quality of their work, according to some educators. They maintain that students are piecing Internet-based information together as if it were from one point of view and entirely factual, although information provided by the Web is decontextualized and sometimes unreliable. One possible explanation for the changing quality of student papers in which “easy” research is heavily used is that the unedited and uncatalogued Web fosters a conflation of information with knowledge. Knowledge stems from access to information, but one is not to be confused with the other. Knowledge arises from putting many kinds of information together and developing a conclusion, a process that occurs through interpretation and critical thought. The Internet provides neither knowledge nor information; rather, the Internet is a source of raw data. When manipulated, this data becomes information, and only through careful evaluation does this information evolve into a well-informed conclusion.

Student researchers need to have an appreciation of this distinction and be able to evaluate data found on the Internet to form a conclusion. In assuming that the Internet provides conclusions rather than wandering pieces of data, students may also assume that evaluating what they find on the Internet is unnecessary. Such a habit might explain the declining quality of student research papers noticed by educators. Knowledgeable statements belong in research papers, while information in raw form usually does not; it might be expected that papers containing “summaries of summaries” have been written by students who do not clearly understand the distinction between “information” and “knowledge.” While the Internet can be easy to use and while Web sites often provide statements that seem conclusive, information found on-line needs to be evaluated just as carefully as information found elsewhere. Without carefully considering the source from which an argument has arisen and the reasoning behind the argument’s conclusion, students are doing little to develop their minds. If the goal of our educational system is indeed to “expand students’ intellectual capacities,” then we should expect students to evaluate any arguments they encounter. Sites on the Internet have varying purposes, perspectives, and credibility in the same way that non-electronic sources do. Any individual who wishes to conduct research via the Internet must consider these qualities.

Information found on the Internet varies in its purpose: Web sites advocate causes, advertise products, entertain visitors and express opinions in addition to presenting scholarly research. No system of classification currently exists, making the Web akin to “a vast, open, and uncatalogued library.” In such a “library,” a student searching for information concerning James Joyce finds
personal Web pages that mention James Joyce, chat rooms in which several of Joyce’s works are discussed and sites that allow them to order Joyce’s books. The ability to determine a Web site’s purpose allows the individual to sort through the decontextualized material appearing on the Web and focus on the sites that may be the most helpful.

While it is necessary that students be taught to distinguish propaganda and commercially driven information from that which is academically informative, this step is just the first of many steps toward evaluating information found on the Internet. As with all presentations of information, a particular individual or group of individuals creates Web sites with a particular perspective on the issue they are addressing. That perspective guides the inclusions and exclusions that eventually result in what becomes the finished Web page. Awareness that a site stems from a perspective forewarns the learner to be on guard. The site is a proposed knowledge claim, not necessarily a dependable guide to reality. While written material is edited and revised before publication, Web pages simply “appear” on the Internet.

There is no governing board or editorial staff whose responsibility it is to ascertain that Internet sites present well-informed conclusions or even truthful statements. In some cases, Web search engines provide rating systems to help people find reliable sources of information. Lycos, Infoseek, and Yahoo are examples of searching tools that rate sites along a scale, typically awarding ratings from “excellent” to “poor”. While such tools can be helpful, Sorapure, Inglesby and Yatchisin (1998) note that the criteria by which sites are judged are often left unspecified, as are the qualifications of the reviewers awarding the ratings. It is essentially up to the student to determine a Web site’s worth as a resource.

The creation and expansion of the Internet has changed the way we communicate. There are many advantages to letting this technological advance also change the way we learn: information on the Internet is readily available, convenient, and interactive. Having access to advanced technology does not mean that the student researcher is using an advanced form of information, however. Information found on the Internet is subject to the same careful evaluation as that found in other mediums. Even the best of Web sites, those that state their purpose, recognize their origination from particular political or social stances and are well grounded in their content, must be carefully scrutinized. Thus; the Internet is of value as a research tool only to the extent that the student is willing to practice careful evaluation.
Preparing Students to Use Critical Thinking on Information from the Internet

For students to see benefit from the hard work necessary to acquire critical thinking skills, they need the firm recognition for them to interact with knowledge using anything other than the sponge method of learning. Imitating the sponge is relatively easy. But it is especially attractive when the learner believes that the world is divided into broad categories of people, roughly corresponding to the knowers and the as-yet uninformed. From that perspective on knowledge, critical thinking has little use. The uninformed should simply slide up to the knowers and absorb respectfully. Given the ease with which anyone can submit arguments to the Internet, the resulting sponge approach to learning is even more problematic than it is for print media. Consequently, the most foundational step in preparing learners for using critical thinking on the Internet is convincing them that such an approach to understanding and belief formation is dangerous and confused.

The best approach to helping them see this need is as simple as it is compelling. Encourage them to never stop looking for evidence, arguments, or information on the Internet until they have looked at several sites claiming to provide the material you seek. What is so effective about that strategy? The conflict they will find if they follow that approach leaves them little cognitive room to retain a belief in the accuracy of any given sources of information. Face to face with conflicting expertise, the learners realize that they need technique and process for negotiating among those conflicting claims. This realization is just the opening the critical thinking teacher needs. Providing illustrations of conflicting Web sites is a productive first step in driving home this idea of the need to look at multiple sites.

Conclusion

The impetus for critical thinking on the Internet is the same as it is with respect to other forms of discourse. Critical thinking is a liberating mechanism, allowing us to select the arguments that best meet our rhetorical standards. If students are going to rely on the Internet to the extent that it seems they do and will, renewed attention to applying critical thinking to the Internet is mandated.

Basic Concepts of Intellectual Property Rights (IPR)

1. What is Intellectual Property?

Despite the number of international agreements and conventions dealing with intellectual Property, none of them attempts a definition of this term, but rather lists the categories of intellectual property within their purview. The
Convention Establishing the World Intellectual Property Organization (WIPO) concluded at Stockholm on 14 July 1967, in Article 2(viii), defines intellectual property as rights relating to:

(1) literary, artistic and scientific works;
(2) performances of performing artists, phonograms and broadcasts;
(3) inventions in all fields of human endeavour;
(4) scientific discoveries;
(5) industrial designs;
(6) trademarks, service marks and commercial names and designations;
(7) Protection against unfair competition.’

Since the date of that Convention, intellectual property rights have been considered to attach to plant varieties, integrated circuits, trade secrets and confidential information and expressions of folklore. A fuller catalogue of intellectual property rights is listed in Part II of the TRIPS Agreement as the subject matter of that agreement, namely: copyright and related rights, trademarks, geographical indications, industrial designs, patents, layoutdesigns (topographies) of integrated circuits and confidential information.

intellectual property is usually divided into two branches, namely: ‘industrial property’ and copyright and the rights which neighbour upon copyright. In the catalogue of rights contained in Article 2(viii) of the WIPO Convention, listed above, items (1) and (2) embrace copyright and the rights which neighbour upon copyright. The balance fall within the rubric of industrial property.

2. Categories of intellectual property

2.1 Copyright and neighbouring rights

Copyright law is concerned with the protection and exploitation of the expression of ideas in a tangible form. Originally, the subject matter of copyright protection was printed literary artistic and literary works. As reprographic technology has improved protection has been extended to technical drawings, maps, paintings and to three-dimensional works such as sculptures and architectural works and to photographs and cinematographic works. More recently, copyright protection has been extended to computer programmes and to databases, which are treated as if they are literary works or compilations of literary works.
The owner of a copyright work may exclude others from using it without authorisation. The acts which require the authorisation of the copyright owner are usually: copying or reproducing the work; performing the work in public; making a sound recording of the work; making a motion picture of the work; broadcasting a work through the electromagnetic spectrum or through cable diffusion; and translating or adapting the work.

In addition to these rights certain ‘moral rights’ have been recognised by the Berne Convention for the Protection of Literary and Artistic Works. These include the right to claim authorship of a work and the right to object to any distortion, mutilation or other modification of, or other derogatory action in relation to, a work which would be prejudicial to an author’s honour or reputation. These moral rights usually remain with an author, even after the transfer of the various economic rights mentioned above. Moral rights could become relevant where a franchisee modifies the materials supplied by the franchisor.

Three kinds of rights neighbour upon copyright protection. These are the rights of performing artists in their performances, the rights of producers of phonograms and the rights of broadcasting organisations in their radio and television programmes. In the case of a franchise, copyright will protect operating manuals, advertising material and the various documents supplied by the franchisor. In the operation of the franchise, neighbouring rights issues may be raised where music is played in the franchise premises.

2.2 Trade marks

As with copyright, patents and industrial designs, most countries have enacted statutes which provide for the registration and protection of trade marks. A trade mark is a sign which serves to differentiate the goods or services of an enterprise from those of other enterprises. Originally trade marks were protected for use in relation to goods, but in recent years the marks used in relation to services have been embraced by this style of protection. Some countries also provide for the registration of collective marks and certification marks. Collective marks are those used by a group or organization to distinguish the characteristic features of products used by that group or organisation. Certification marks may form the same function as collective marks, but they have the added feature that the users of the certification have to meet a designated standard of good or service.

Applications for registration of a trade mark have to list the goods for which the sign is to be registered. Trade mark laws provide generally for a classification of goods for the purposes of registration. In some countries a
separate application has to be made for each class, whereas in others one application is sufficient for several classes. Most countries classify the classes of goods and services for registration purposes according to the Nice Agreement Concerning the International Classification of Goods and Services for the Purposes of the Registration of Marks.

Finally, one or more lots of fees have to be paid for the registration of a trade mark. A country may provide for a single, all-encompassing fee or several application fees (application fee, class fee, examination fee, registration fee, etc.). The application is examined to ensure compliance with the formal registration requirements, as well as with the substantive requirement of distinctiveness. There also has to be a check as to whether a mark is in conflict with prior rights. After the publication of an application, there is an opposition process whereby an interested third party may protest the registration of a mark, usually on the grounds of prior rights or deceptive similarity with another mark.

Upon acceptance of a mark, registration is conferred for a term of 10 years with a possibility for renewal. A mark will expire if a renewal is not sought. Removal of a mark may also be sought where its use becomes deceptive or where the mark becomes generic of goods or services. For example the marks 'Vaseline' and 'Gramophone' are two examples of marks which became generic descriptions of the type of goods to which they were appended. The registered owner also has the exclusive right to transfer (assign) the mark and also to exploit it through the supply of goods and services bearing the mark and through licensing and franchising others to use the mark. In circumstances where there is a similarity of marks, in relation to identical goods or services, or where the goods or services are similar in relation to which identical marks are used, there must exist a likelihood of the confusion of consumers. Usually, the same tests for confusion are used as an assessment of confusion for the purposes of registration.

Thus as a general rule goods are similar if, when offered for sale under an identical mark, the consuming public would be likely to believe that they came from the same source. All the circumstances of the case must be taken into account, including the nature of the goods, the purpose for which they are used and the trade channels through which they are marketed, but especially the usual origin of the goods, and the usual point of sale. Most trade mark laws make it clear that the exclusive rights in a trade mark are infringed by the use of that mark without the consent of the registered proprietor. The lack of consent has to be established by the trade mark owner. If the defendant relies upon a specific licence or other permission to use the mark, the defendant bears the onus of establishing consent. When a trade mark owner has launched a product
on the market under his mark, he cannot object to further sales of the product in the course of trade. This is the essence of the so-called principle of exhaustion of the trade mark right. Some countries do not allow objections to parallel imports of products marketed in a foreign country by the trade mark owner or by a third party with his consent. Other countries do allow such parallel imports to be objected to, namely by applying the principle of territoriality of rights. If the owner fails to renew his trade mark registration and more specifically fails to pay the renewal fee, this leads to the removal of the trade mark from the register. Registries generally allow a grace period for payment (i.e. an agreed period of time when no payments are expected) of the renewal fee (usually with a surcharge).

2.3 Geographical Indications

Constituting a specialised form of trade mark, which has been identified as the subject of a separate system of protection, are those marks which identify that a product or service originates in a country, region or particular place. The false or deceptive indication of source is actionable. An appellation of origin is a mark which indicates that in addition to the geographic source of goods, the place of origin decisively influences the character or quality of the goods. For example, the soil and climatic influences in a wine producing district, such as Burgundy or Champagne can be demonstrated to produce a wine of such a particular quality, that it would be deceptive to permit other wine producers to use those appellations of origin.

2.4 Confidential Information (Trade Secrets)

To be protected as confidential information, the information must have: (i) the necessary quality of confidence about it (i.e. it cannot be information already known to the public); (ii) it must have been imparted in circumstances importing an obligation of confidence (e.g. where a person is told that the information that will be communicated to them is confidential), or where the parties’ relationship is one of confidence (e.g. solicitor– client); or (iii) it has been used to the detriment of the party communicating it.

2.5 Patents

A patent is a statutory privilege granted by a government to an inventor and to other persons deriving their rights from the inventor, for a fixed period of years, to exclude other persons from manufacturing, using or selling a patented product or from using a patented method or process. Patent rights are conferred by statute as a matter of right to the person who is entitled to apply for it and who fulfils the prescribed registration requirements. The protection secured by the registration of a patent is commonly limited in time, usually 20 years. At the
end of the period of protection, the patented invention is said to be within the public domain (i.e. available for anyone to exploit).

An invention is usually defined as an idea which permits the solution of a specific problem in a field of technology. The applicant for the protection of an invention is usually the inventor or his successor in title. To obtain a patent an application is filed with the relevant industrial property office. The application will contain, among other things, a description of the invention, with any drawings referred to in the description and the claims made for the invention. The description must disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The disclosure of the invention has to present the invention in the context of the state of the art. Since to be patentable the invention must offer a novel solution to a technical problem, the description has to relate the invention to the background art. The function of the claim is to define the scope of the protection which is sought.

For an invention to be protected by a patent, it must provide a novel solution to a technological problem, involve an inventive step and be industrially applicable. An invention is conventionally considered to be novel if it is unknown or unavailable to others prior to the date of application for the patent embodying that invention. That is, the invention must not be anticipated by prior art. Prior art is usually taken to comprise everything disclosed to the public, anywhere in the world by prior publication in a tangible form or in the subject country by oral disclosure, or by use in any way prior to the filing of the patent application.

An invention is said to involve an ‘inventive step’ if, having regard to the prior art, it would not have been obvious to a person having an ordinary skill in the art. In other words, the invention must involve a creative advance on existing knowledge. The requirement that an invention be industrially applicable, excludes from patent protection purely theoretical inventions which cannot be carried out in practice. The notion of an applicability which is ‘industrial’ connotes a commercial scale of application. Embraced within the concept of ‘industry’ are agriculture, fishing and extractive activities.

A patent application is examined by the appropriate registration office to ensure that the application meets the formal registration requirements. The application may then proceed to examination as to substance. For example, the registration authority may institute a search of the patent documents of other nations and of significant technical journals and other publications to ensure that an applicant’s invention has not been previously disclosed. Some countries permit the registration of patents for inventions which have only been partially disclosed in prior art. Some countries confine relevant prior art to national disclosure, or to prior use and prior oral disclosure.
The application may be published or laid open for public inspection before a patent is granted. An opportunity may be given for third parties to oppose the grant of protection. After the examination of the application as to form and to substance and after the consideration of any opposition, the registration authority will decide on whether to grant a patent. The fact of the granting of the patent will be published in an official gazette.

In some countries patent protection is not available for all inventions. For reasons of national interest some countries withhold patent protection from inventions pertaining to agriculture, food, medical and pharmaceutical products and nuclear and computer technology. Because patent protection extends only to inventions of a technological nature, protection is generally withheld from advances relating to methods of business, including financial and accounting techniques, as well as from medical treatments, plant varieties and animal breeds. This is not the case in the USA, where patents are available for business ideas, including franchise ideas.

2.6 Industrial Designs

An industrial design is the ornamental or aesthetic aspect of a useful article. The WIPO Model Law for Developing Countries on Industrial Designs defines ‘industrial design’ as ‘any composition of lines or colours of any three-dimensional form...[which] gives a special appearance to a product of industry or handicraft and [which] can serve as a pattern for a product of industry or handicraft’. As with patents, most countries require novelty or originality. The standard of novelty varies between universal or national novelty. A difficult issue in designs protection is the extent to which a design must differ from an earlier design to be considered novel. Minor variations are usually inadequate. A desirable test is whether the design claimed is subjectively new in the sense that it is not an imitation of designs already known to the creator. The critical feature of industrial applicability is that the design is repeatable in commercial quantities. Thus items of artistic craftsmanship are outside the scope of design protection and more properly protectable under copyright laws.

A significant feature in the debates concerning the protection of industrial property designs under the TRIPS Agreement was the extent to which ‘functional’ designs, such as those used for motor vehicle spare parts could be protected. Industrial designs are usually protected against unauthorised copying or imitation for of periods around 10 years.

2.7 Layout-designs (topographies) of integrated circuits

The design of the layout, or architecture, of the electrical circuit of a semi-
conductor chip, which is transferred and fixed in a chip during its manufacture has been protected in a number of countries as a *sui generis* intellectual property right. Provision for this form of protection was provided for in the Treaty on Intellectual Property in Respect of integrated Circuits negotiated in Washington D.C. on 26 May 1989. Although this treaty did not meet with the approval of its sponsors, the protection of layout designs is now provided for in the TRIPS Agreement.

Layout designs are protected against unauthorised copying or imitation, with a defence for those designs arrived at by a process of reverse engineering. The term of protection varies from 8 years in the Washington Treaty to 10 years in statutes based on the US or Japanese model.

### 2.8 Biotechnological Rights and Plant Varieties

Biotechnological invention, particularly through the practice of genetic engineering, has become increasingly important for agriculture and for the treatment of disease. Historically, the question of the patentability of ‘animate’ substances proceeded down a separate legal channel to that concerning the patentability of plant varieties. Originally, it was considered that discoveries involving living organisms and material were not inventions for the purposes of most patent statutes. Exceptions to this principle were made for micro-organisms used in fermentation and in antibiotics. However, in 1969 the Supreme Court of the Federal Republic of Germany ruled that animal breeding techniques were patentable, provided that the technique was repeatable. See *Rote Taube (Red Dove)* (1970) 1 *IIIC* 136.

In the United States, the courts had consistently rejected claims for the patentability of animate matter until the 1980 decision of the Supreme Court in *Diamond v Chakrabaty* 447 US 303 (1980). In that case the Court ruled that a genetically engineered bacterium capable of breaking down the components of crude oil was patentable. It recognised that the basic test for patentability was not whether an invention involved living or inanimate subject matter, but whether it involved a human-made invention. Plant breeders’ rights are of greater antiquity. From the 1920s a number of European countries have recognised various kinds of plant breeders’ rights. From the 1930s plant varieties were admitted to patent protection in the USA and Germany and subsequently in Austria, Belgium, France, Germany, Hungary, Italy, Japan and Sweden. In 1961 an International Convention for the Protection of New Varieties of Plants (*UPOV Convention*) was concluded in Paris. A matter which has exercised the minds of participants at diplomatic conferences to revise the UPOV Convention is whether to permit the simultaneous protection of plant varieties both through patent protection and through plant variety legislation.
Access to biotechnology has become a pressing issue for developing countries which are often the genetic source of engineered varieties. A convention for the preservation of access to world genetic resources has become part of the international debate surrounding agitation for the preservation of biodiversity.

Self-Assessment Question (SAQ)

SAQ 1: For each of the following intellectual property examples state the area of IP law that would be most appropriate for their protection:

1) A company wishes to ensure that no-one else can use their logo.
2) A singer wishes to assign the rights to reproduce a video she made of her concert.
3) A new way to process milk so that there is no fat in any cheese made from it.
4) A company has decided to invest in packaging, which is distinctive, and they wish to ensure that they have sole use.
5) A company decides to use a logo that has the same shape as its competitor but with a different colour.

SAQ 1 Answer:

1) Trademark
2) Related Rights
3) Patent
4) Industrial Design
5) Unfair Competition


The reason for States to enact national legislation, and to join as signatories to either (or both) regional or international treaties governing intellectual property rights include:

• to provide incentive towards various creative endeavors of the mind by offering protections;
• to give such creators official recognition;
• to create repositories of vital information;
• to facilitate the growth of both domestic industry or culture, and international trade, through the treaties offering multi-lateral protection.
4. History

Historically, IP regimes have been used by countries to further what they perceive as their own economic interests. Countries have changed their regimes at different stages of economic development as that perception (and their economic status) has changed. For example, between 1790 and 1836, as a net importer of technology, the US restricted the issue of patents to its own citizens and residents. Even in 1836, patents fees for foreigners were fixed at ten times the rate for US citizens. Only in 1861 were foreigners treated on an (almost wholly) non-discriminatory basis. Until 1891, US copyright protection was restricted to US citizens but various restrictions on foreign copyrights remained in force (for example, printing had to be on US typesets) which delayed US entry to the Berne Copyright Convention until as late as 1989.

Numerous countries have at times exempted various kinds of invention in certain sectors of industry from patent protection. Often the law has restricted patents on products confining protection to processes for their production. Typically these sectors have been foodstuffs, pharmaceuticals and chemicals, based on the judgement that no monopoly should be granted over essential goods, and that there is more to be gained by encouraging free access to foreign technology, than by potentially stimulating invention in domestic industry. This approach was adopted by many countries which are now developed in the 19th Century and for some until late in the 20th Century, and also in the East Asian countries (such as Taiwan and Korea) until relatively recently.

Intellectual property, and patents in particular, have often been politically contentious. Between 1850 and 1875, a debate raged in Europe, both in academic and political circles, on whether the patent system was a blight on free trade principles or the best practical means of stimulating inventions. In Switzerland in the 1880s, industrialists did not want a patent law because they wished to continue to use the inventions of foreign competitors. Switzerland did eventually adopt a patent law, with various exclusions and safeguards, not because most Swiss thought there was any net benefit to be had from allowing foreign patents, but because Switzerland came under intense pressure, particularly from Germany, to do so and did not wish to invite retaliation from other countries. Safeguards adopted included provisions for compulsory working and compulsory licensing which enabled the government to enforce production in Switzerland by one means or another, if it so desired. In addition, chemicals and textile dyeing were excluded from patent protection. Elsewhere in Europe the proponents of the patent system also largely won the argument, just as the free trade movement waned in the face of the Great Depression in Europe.
In the recent history of development are the countries in East Asia which used weak forms of IP protection tailored to their particular circumstances at that stage of their development. Throughout the critical phase of rapid growth in Taiwan and Korea between 1960 and 1980, during which their economies were transformed, both countries emphasised the importance of imitation and reverse engineering as an important element in developing their indigenous technological and innovative capacity. Korea adopted patent legislation in 1961, but the scope of patenting excluded foodstuffs, chemicals and pharmaceuticals. The patent term was only 12 years. It was only in the mid-1980s, particularly as a result of action by the US under Section 301 of its 1974 Trade Act, that patent laws were revised, although they did not yet reach the standards to be set under TRIPS. A similar process took place in Taiwan. In India, the weakening of IP protection in pharmaceuticals in its 1970 Patent Act is widely considered to have been an important factor in the subsequent rapid growth of its pharmaceutical industry, as a producer and exporter of low cost generic medicines.

The general lesson history shows us is that countries have been able to adapt IPR regimes to facilitate technological learning and promote their own industrial policy objectives. Because policies in one country impinge on the interests of others, there has always been an international dimension to debates on IP. The Paris and Berne Conventions recognised this dimension, and the desirability of reciprocity, but allowed considerable flexibility in the design of IP regimes. With the advent of TRIPS, a large part of this flexibility has been removed. Countries can no longer follow the path adopted by Switzerland, Korea or Taiwan in their own development. The process of technological learning and of progressing from imitation and reverse engineering to establishing a genuine indigenous innovative capacity, must now is done differently from in the past.

5. Impacts of IP

Policies and legislation related to protection of IPR should be as important instruments in the economic, social, scientific and technological development strategy of the country, both for the short and long-term. Efficient and effective protection of intellectual property rights is vital for the development of the domestic economy, for promoting foreign investment, for the transfer and dissemination of technology, and for increasing local jobs and income as well as facilitating the integration of the national economy into regional and global economies. Recent surveys of the role of IP in promoting innovation and economic development, eg by the World Bank and the UK Commission on Intellectual Property Rights have indicated that the role which IP might play in will depend upon the size of the economy. Analysis of the available evidence on the impact of
IPR regimes on developing, or developed countries, is a complex task. The capacity of countries to develop their own process of technological innovation and to enable them to absorb effectively technologies developed abroad is dependent on a large number of elements. It requires an effective education system, particularly at the tertiary level, and a network of supporting institutions and legal structures. It also requires the availability of financial resources, both public and private, to pursue technological development.

6. IP and Technology Transfer

The Preamble to TRIPS notes the particular needs of developing countries in the context of technological improvement, stating: ‘Recognizing the underlying policy objectives of national systems for the protection of intellectual property, including developmental and technological objectives;’

Recognizing also the needs of the least-developed country Members in respect of maximum flexibility in the domestic implementation of laws and regulations in order to enable them to create a sound and viable technological base.’ Thus, the agreement recognises both that technological development is an IPR-related policy objective of all nations and that the least-developed countries (LDCs) have particular foundational needs in terms of creating a technological base. The former point suggests that IP standards may be structured, within the framework of TRIPS, in ways that enhance technology acquisition and diffusion, without regard to development level. The latter point recognises that the LDCs should deploy ‘maximum flexibility’ in their intellectual property rights in order to benefit sufficiently from foreign technologies and that they may be able to establish the kind of manufacturing and marketing competence to permit their entry onto the lower rungs of the global technology ladder.

Article 7 states technology transfer as a basic objective of TRIPS in providing that: ‘The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.’

How broadly one should interpret the scope of this objective is subject to debate. It has been argued that the regimes adopted not only by developing countries but also those by developed countries and those reached in bilateral and multilateral consultations should promote technology transfer and diffusion. The substantive obligations of TRIPS could be read against this objective. Article 8.1 permits countries to take measures ‘...to promote the public interest in sectors of vital importance to their socio-economic and technological
Article 8.2 recognises that countries may wish to adopt policies: ‘...to prevent the abuse of intellectual property rights by rights holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology.’

The language again recognises the centrality of technology transfer as an objective for the intellectual property system. The most direct language on technology transfer arises in Article 66.2, which states: ‘Developed country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base.’ It requires only developed countries to provide such incentives, and only on behalf of the LDCs. No obligations or rights are created for the developing and transition countries.

Thus, developed nations must find means to define and provide such incentives. Also, while the incentives involved must promote and encourage technology transfer the language does not say they must actually achieve increases in technology transfer. Indeed, governments cannot coerce private firms to take up these incentives. Recognising that developing countries and LDCs would face considerable difficulties in implementing TRIPS, Article 67 obligates the developed countries to technical assistance covering the entire agreement: ‘In order to facilitate the implementation of this Agreement, developed country Members shall provide, on request and on mutually agreed terms and conditions, technical and financial cooperation in favour of developing and least-developed country Members. Such cooperation shall include assistance in the preparation of laws and regulations on the protection and enforcement of intellectual property rights as well as on the prevention of their abuse, and shall include support regarding the establishment or reinforcement of domestic offices and agencies relevant to these matters, including the training of personnel.’

There is no mention here of technology transfer or dissemination. Presumably, however, its scope extends to means of making Article 66.2 effective, at least for LDCs. In this context, technical assistance should extend to programs improving the ability of LDCs to attract and absorb technology transfer. Intellectual property played a significant role in the WTO Ministerial Meeting, which concluded at Doha on 14 November 2001 at which the development agenda of the WTO was formulated. The Ministerial Declaration, which was issued at Doha in Article 19 instructed the Council for TRIPS, in pursuing its work programme including the review of the implementation of the TRIPS Agreement under Article 71.1 to be ‘guided by the objectives and principles...’
set out in Articles 7 and 8 of the TRIPS Agreement and shall take fully into account the development dimension.’

There is an argument for linking Article 66.2 and Article 67 to Article 71 as a positive obligation. Specifically, developing countries could argue that building a ‘sound and viable technological base’ (Article 7) requires institutional reforms (including implementing and enforcing intellectual property rights), infrastructure, and an effective science and technology policy, all of which are costly. Thus, developing countries could commit to making a good faith effort to improving the environment for technology transfer if developed countries are prepared to offer much more technical assistance and sustainable funding for such reforms.

Donor countries and organisations could consider establishing special trust funds for the training of scientific and technical personnel, for facilitating the transfer of technologies that are particularly sensitive for the provision of public goods, and for encouraging research in developing countries. TRIPS Article 40 sets out a general right for countries to establish and enforce antimonopoly policies for purposes of combating abusive technology licensing practices. Remedies may include a variety of restrictions on behaviour and the exercise of intellectual property rights, including compulsory licensing to expand competition, a practice that is central to US competition policy.

7. Enforcement of IPRs

A critical determinant of investment and technology transfer is the availability to investors and transferees of an effective enforcement regime. One of the principal motives for including intellectual property rights as a subject of the Uruguay Round of the GATT was the perception that the existing international intellectual property regime lacked effective enforcement. The Ministerial Declaration of 20 September 1986 which launched the Uruguay Round explained that: ‘In order to reduce the distortions and impediments to international trade, and taking into account the need to promote effective and adequate protection of intellectual property rights, and to ensure that measures and procedures to enforce intellectual property rights do not themselves become barriers to legitimate trade, the negotiations shall aim to clarify GATT provisions and elaborate as appropriate new rules and disciplines.

Negotiations shall aim to develop a multi lateral framework of principles, rules and disciplines dealing with international trade in counterfeit goods, taking into account work already undertaken in the GATT.’ Consequently, Part III of the TRIPS Agreement obliges Members to establish a comprehensive enforcement regime. The five paragraphs of Article 41 enunciate the general enforcement
obligations which are incumbent upon Members. Articles 42 to 50 set out the
civil and administrative procedures and remedies which are required to be offered
intellectual property rights holders. Article 61 requires the institution of criminal
procedures and remedies in the case of wilful trademark counterfeiting or
copyright piracy on a commercial scale’. A significant innovation is the scheme
for the border control of intellectual property counterfeiting which is contained
within Articles 51 to 60, which is discussed in the next chapter. As a corollary to
the enforcement provisions of the Agreement, measures are adopted in Articles
63 and 64 for the establishment of multilateral consultation and dispute
settlement procedures.

**ROLE OF INFORMATION TECHNOLOGIES IN TEACHING LEARNING PROCESS**

Information technologies have affected every aspect of human activity
and have a potential role to play in the field of education and training, specially,
in distance education to transform it into an innovative form of experience. The
need of new technologies in teaching learning process grows stronger and faster.
The information age becomes an era of knowledge providing sound and
unmatched feasibility for discovery, exchange of information, communication and
exploration to strengthen the teaching learning process. Information technologies
help in promoting opportunities of knowledge sharing throughout the world.
These can help the teachers and students having up-to-date information and
knowledge. Accurate and right information is necessary for effective teaching and
learning; and information technologies are “set of tools that can help provide the
right people with the right information at the right time.” Students are
independent and they can make best decisions possible about their studies,
learning time, place and resources. Students are able to work in collaborative
and interactive learning environments effectively communicating, sharing
information and exchanging ideas and learning experiences with all in the
environment.

**Introduction**

One of the basic functions of education is preparation of students for
life. This function in 21st century may be participation in an information rich
society, where knowledge is regarded as the main source for socio-cultural and
polito-economical development of countries and/or nations. Information rich
societies are developed and dominating and they are controlling the information
throughout the world. Information encompasses and relies on the use of different
channels of communication, presently called information and communication
technologies and would be incorporating better pedagogical methods to cope with
such emerging situations. These have changed the scenario of education particularly, pedagogy and instruction making teaching learning process more productive creating collaborative, learner centered and interactive global learning environments. Therefore, information technologies are assumed to play a constructive role in education to make the teaching and learning process more productive through collaboration in an information rich society.

Information rich society promotes new practices and paradigms for education where the teacher has to play new role of mentoring, coaching and helping students in their studies rather to play the conventional role of spoon feeding in the classrooms. Students can learn independently having a wide choice of programme selection and access to information. Students can be involved in skill oriented activities in group learning environments for accumulated knowledge. They can interact and share learning experiences with their teachers and fellow learners in knowledge construction and dissemination process. They can receive and use information of all kinds in more constructive and productive profession rather depending upon the teacher. Branson (1991) stated that students learn not only by the teacher but they also learn along with the teacher and by interacting with one another. Indeed, now students can learn much more than that the teacher teaches in conventional learning environments.

For productive teaching learning process teachers and students have to use information technologies according to their requirements and availability.

Information Technologies

The history of information storage and dissemination indicates that human being used different things for information storage, its display and transmission. In different ages people used different materials and methods for communication such as rocks and stones, papyrus, palm leaves, animal leather and handcrafted manuscripts for storing and transmitting the information from one place to another and to the next generation. These means of information were limited and confined to the elites but “the advent of printing enabled information to be truly widespread throughout the world to move to a more equitable level in terms of access to knowledge”. At present, knowledge may be regarded as power and it comes from having information. Information encompasses and relies upon the use of different communication channels or technologies – called information technologies, for its effectiveness and equal access. Information technologies may extend knowledge beyond the geographical boundaries of a state or country providing relevant information to the relevant people round the clock.

Information Technology “is any computer-based tool that people use to
work with information and support the information and information processing needs of an organization”. It includes computers and its related technologies; WWW, Internet and Videoconferencing etc. Information technology can be used to promote the opportunities of knowledge dissemination. It can help the teachers and students having up-to-date information and knowledge. Accurate and right information is necessary for effective teaching and learning; and information technology is a “set of tools that can help provide the right people with the right information at the right time.”

In this sense, information technologies may the result of knowledge explosion, where according to Marriam, and Cafarella, “computer technology (software) extends the mental ability.” Therefore, information technologies may include computer and its related technologies of high tech and low touch nature. Charp, (1994) called them emerging technologies and stated that these are the products coming out of laboratory and into the hands of educational community. These include wireless communications, the information highway, asynchronous mode, integrated services digital networks (ISDN), multimedia applications, personal digital assistants, artificial intelligence and virtual reality. These technologies would be big of brain and small of mass, depending upon computer technology for their effectiveness and increased capabilities. Similarly, Rashid, M. (2001) discussed the interactive video, CD-ROM, compact video disc, Internet, WWW, teleconferencing, computers, satellites and e-mail as emerging information technologies, and according to him these are “current technologies incorporating into the teaching learning environment [process]”

**INFORMATION TECHNOLOGIES AND TEACHING LEARNING PROCESS:**

**Making Students Independent in their Studies**

Using information technologies students can decide about their studies, learning time, place and resources in a better way. Students can work in more supportive environments, seek help from teachers and fellows, and share their learning experiences and ideas in romantic and productive fashion. Dede stated that the development of high performance computing and communication is creating new media such as the WWW and virtual realities. In turn these new media enable new type of messages and experiences, such as interpersonal interactions in immersive synthetic environments lead to the formation of virtual communities. The innovative kinds of pedagogy empowered by these emerging media and experiences promoted the opportunities of distance education and at present virtual education and eliminated the barriers of distance and time. New and innovative learning experiences would be enhanced and encouraged by these technologies, as by virtual communities, which exist by interactions across the
globe through global network of computers round the clock. The global sharing of experiences would make possible the group presentation form of instruction in distance education. Distance education encompasses and relies on the use of information technologies to make learning more productive and more individualized, to give instruction a more scientific base and make it appropriate & more effective, learning more immediate and access to resources more equal. These remarkable aspects can expand the quality and quantity of instructional resources. They can serve learners at their ease in terms of time and place. Rashid stated that:

Both teachers and learners can work with others at remote sites.

The community of learners can expand to include virtually anyone who wishes to obtain information and who is not excluded by policy or cost.

They can provide real access to experts in universities, research laboratories, the business community, government agencies and political offices. Information technologies can promote the opportunities of restructuring the teaching learning process. These can transform teaching and learning by offering alternatives to the teacher provided information, access to virtually unlimited resources and opportunities for real world communication, collaboration and competition. The phases of this process as described by Marriam et al are,

“developing awareness – recognizing that something is wrong or different;
exploring alternative – researching for new ideas from other institutions and acknowledging that change is needed;
making a transition – leaving the old approaches behind (or dramatically changed);
achieving integration – putting the pieces from the transition phase back together; and

taking action – putting new ideas into operation”.

The process can work at instructional programme or institutional level and one or more phases work simultaneously. Traditional lectures and demonstrations can become webbased multimedia learning experiences for distance learners. Web can enrich the learning resources and institutions refocus from teaching to learning, from teacher to learner. It can create learning environment throughout the world by networked learning communities. Networks may create educative environments embedded in democratic philosophy of instruction and helping learners learn. The characteristics of
which are:

“respect for personality;
participation in decision-making;
freedom of expression and availability of information; and
mutuality of responsibility in defining goals, planning and conducting activities and evaluating [the process]”.

Learning may take place more effectively and dynamically in educative environments where teacher and learners are open to each other to interact and exchange information and experiences in a friendly way. Ennis (1989) concluded in a study “Openness on the part of instructor increased their [learner’s] desire to discuss problems or topics of interest... these discussions expanded their [learner’s] understanding of the content and assisted them in planning the information within a relevant context in their own lives”. Educative environments can enhance and shape the teaching learning process to achieve the desired goals. There is a natural tendency for students to learn and learning can accelerate, in interactive and encouraging environments. Accelerating the encouraging environments may be psychological climates and students’ interactions can create them. Interactions of students can make learning environment more effective and meaningful and ‘much of learning takes place in a meaningful environment’. Learners may get immediate feedback and reinforcement through web-based learning.

The psychological fashion of such reinforcement and expectancy also influences the potential for any given behaviour and/or learning to occur. Desired learning always requires access to qualitative and latest information resources and web confirms the increased access to such resources at students’ pace. Moreover, Aggarwal says “there is no denying that web-based courses open new educational access to the non-traditional and geographically dispersed students. The on-line setting provides a level of flexibility and convenience not provided by traditional classroom courses”.

Internet and WWW provide learners latest relevant information at their own pace and they can form a virtual community of learners at global level. Teaching organizations are adopting information and communication technologies specially the computers, World Wide Web, teleconferencing and educational television because of their cost effectiveness, access and flexibilities of choices.

Students Use Information Technologies to:
1. Participate in a media revolution, profoundly affecting the way they think about and use information technologies.

2. Improve the ways of learning in new learning fashions

3. Extend the ability and skills of applying their learning in real situation.

4. Working in groups for cooperative and collaborative learning

5. Developing self-learning habits at their own pace and time.

6. Learn with the teacher rather by the teacher.

7. Develop inquiry-learning habits.

8. Use right information at right time to achieve right objective.

9. Review and explore qualitative data.

10. Exchange learning experiences and information with others students and teachers living anywhere in the world.

Information technologies facilitate students in their learning process through their active participation on one hand and help teachers on the other hand. Therefore,

Teachers Use The Information Technologies to:

1. Present the material in more interesting and attractive way.

2. Guide and help students in searching the qualitative material.


4. Coach the students.

5. Provide individualized instruction.

6. Direct the students toward cooperative as well as collaborative learning activities.

7. Prepare learning material for students, rather teaching in conventional situations.

8. Diagnose the learning problem of students and help them to overcome.

9. Solve the study problems of students.

Information technologies affect the teaching learning process in different ways. These helps the teachers in preparing lecture notes for interesting presentation, on the one hand and facilitates the students on the other hand. Different technologies help the teachers and students according to their respective nature and capabilities of storage and presentation. For example
computers are used in education for various purposes as they can store and retrieve a huge amount of information. All 20 volumes of the Oxford English Dictionary are contained on one compact disc. The disc provides instant access to 616,500 words and terms, 137,000 pronunciations, 2.4 million illustrative quotations, 577,000 cross references, and 249,000 etymologies. Similarly, American Memory includes Library of Congress collections of primary materials from American history. Available on a combination of computer audio and videodiscs, American Memory contains 25,500 photographs (dated from 1800 to 1920); 500 prints and cartoons about Congress: 60 sound recordings (pre-radio) of early 20th century leaders; 1,610 color photographs taken during World War 2nd, 28 motion pictures of President William McKinley and 350 pamphlets by blank authors from Reconstruction to the First World War.

Information technologies provide the opportunities of global interactions. Students can learn from interactions with the information, interface, teachers and co-learners using global networks. They can interact at their own and get rid of their routine work. They may review and explore the qualitative as well as quantitative data through computer networks. They can work on group projects participating in peer learning and knowledge building activities. Under the influence of information technologies, teaching and learning occurs in a changed situation. There seems a shift from teacher centered teaching to student centered learning. Menges (1994) stated that the eight “shifts” of Collins (1991) reflect the effects of information technologies on teaching and learning process. These shifts put greater emphasis on the activity of the students than on that of the teacher’s. These include:

A shift from lecture and recitation to coaching

Students learn by interactive technologies and teacher facilitates them on how to use and reflect responses. He/she may be diagnosing learning problems and helping learners to find their solutions. When students work with information technologies, teachers reduce the time they spend directing students; they spend more of their time facilitating student learning.

A shift from whole-class instruction to small group instruction

Students progress at different rates and pace in their learning process. Teachers can interact with individual students and in small groups. They can become better informed of the individual student’s progress and problems in their learning. So they can help and facilitate students individually in more effective way.

A shift from working with better students to working with weaker students
Individual differences exist among students at all levels of learning. Information technologies enable teachers to cope with this problem in large classes working with individual students and in small groups. The teacher is then able to aim instruction at one specific target group and to devote time to those who mostly need help.

A shift from all students learning the same things to different students learning different things

Conventionally, all students had to learn the same things what the teacher intended to teach them in a class. However, now the situation has changed and the use of information technologies has enabled the students to learn what they need, and what they want to learn. There also exists individuality in some common attainments. Resources for learning are available through information technologies, it becomes possible for students to recognize and use the appropriate information to achieve the goals under the tutelage of teacher.

A shift towards more engaged students

Conventionally, majority of students is passive listener in the classrooms for most of the time. Teachers carry on delivering lectures without any concern of students’ participation in the teaching learning process. Use of Information technologies in classroom situation particularly interactive technologies however; ensure attention and active involvement of students.

Well-designed computer-mediated instruction is more likely to engage individuals for effective learning than simple lectures and book reading a classroom.

A shift from assessment based on test performance to assessment based on products and progress

Competencies and skills are necessaries to live a successful and productive life. These may result from undertaking creative projects rather than repeating or paraphrasing information from lectures and textbooks. The best projects include realistic tasks that generalize the student’s learning and its application in new situations. Information technologies actively involve the students in different competency based activities through skill oriented projects in real situations.

A shift from competitive to a cooperative goal structure

Collaborative and cooperative learning approach provides learners the opportunities of extensive interaction. Students have access to extensive databases and share their own work through networked communications to work
on collaborative projects. Teachers guide the students on how to share and interact in networked collaborative learning environments.

A shift from the primacy of verbal thinking to the integration of visual and verbal thinking.

Using information technologies students would have extensive experience with video than with print, yet instruction is based primarily on print. However, visual literacy is poorly understood and poorly utilized in perceiving instruction. Teachers need to consider what capacities for visual knowledge and skills students should possess, and determine how they can ensure progress towards developing these capacities. Information technology can help the teacher on the one hand and facilitates the learners on the other hand. Both, teachers and students get rid of their routine work, and have to play their new roles in new situations respectively. Teachers spend much of their time in assisting the students rather lecturing; and students access the information of their need.

**New situations-New demands**

In the age of information technology, effective and efficient learning is potentially possible at all levels for all round the clock. Content-centered presentation by teachers to large groups of students can not have any justification to be dominant method of instruction. In the era of information technology teachers will be spending more time in facilitating students rather delivering lectures in the classrooms. They would be working in groups; preparing and evaluating instructional materials and organizing data into meaningful information and accessible forms. They will be spending their time in coaching students; helping them to learn through reviewing the huge information. They will be offering group presentations. Presentations will not be used to provide new information instead, presentation will be carefully constructed to model and answer existing questions and solve current problems in certain disciplines. They will also be demonstrating the potential of skill development in students by using information in problematic situations. Menges considers the changed role of teachers of great importance. The following shifts reflect the new role of teachers in new situations.

**A Shift From Covering Material To Assisting Students In Sampling Material**

Teachers decide what is essential and what is optional for students when the information is too much to decide by students. The essential information can be assigned and students guided to work in an effective way. The content should span a variety of media to ensure that students become adept in using information sources and that they experience the effects of diverse media.
A Shift From Unilaterally Declaring What is Worth Knowing
Of Negotiating Criteria That identify What is Important

Instead of providing net packages of content, the teacher plunges into primary sources with students. Together they develop ways to discriminate the more important from the less important. Courses’ exercises can help to develop criteria about the importance of information and its use for specific purposes. Students can discuss these criteria for understanding and developing the new one if needed. A discipline-specific criterion validates the information and enables students to develop expertise in formulating criteria in other disciplines. They must also medium specific as the characteristics of print and electronic information significantly differ from each other.

A Shift From Ranking Students Relative to One Another
To Negotiating Standards Specific to Individuals

Information technologies promote diverse academic opportunities and paths for each student. Students show progress according to their capabilities and some students may progress slowly than others. The teacher can not use uniform standards of achievement and uniform rate of learning to evaluate students’ work. Therefore, it would be necessary to negotiate learning objectives and rates of progress that reflect individual interests, abilities, skills and needs.

A Shift From Grading According To Individual Attainments
To Grading According To Collaborative Contributions

Evaluation of individual work is easy. But judging and rewarding individuals’ work in group performance is difficult because roles and responsibilities of each group member vary. Information technologies permit almost variability in the tasks that group members pursue.

A Shift From Merely Verifying Student Source
To Deriving Standards for Fair Use and Credit

Plagiarism is a curse in academic affairs. For a teacher it is too difficult to verify all the sources to ensure the originality of students’ work. This role of plagiarism detector seems impractical when sources are so numerous and information can be so easily altered. But the computer software has made it possible to detect the plagiarism.

A Shift From Requiring Students To Produce Knowledge
To Rewarding Them for Demonstrating Originality

A student should have the skills and capabilities of understanding and
applying knowledge in real situations. Without the application of knowledge students can no longer retain it and soon they forget. In the era of information technologies students should be able to apply core concepts and generalize principles to significantly different situations. Exposure to information technologies leads to this affective principle.

Information technologies would develop in students; the ability of judging the validity and precision of information. Learning by information technologies, students would analyze and explore the information to achieve certain objectives of their study.

**PREPARATION FOR THE AGE OF INFORMATION TECHNOLOGY**

Certain skills capabilities of using different information technologies are necessary for students as well as teachers. Therefore, gradual encounters with the technologies are necessary to prepare themselves for the age of information technology. They will anticipate in the age of information technology as:

- Requiring students to use electronic databases in their searches.
- Encouraging students to use electronic mail to ask questions, and for submitting assignments.
- Becoming familiar with the advantages and disadvantages of the technologies and exploring the capabilities of compact-disc read-only memory (CD-ROM), tele/videoconferencing etc.
- Surveying students about their familiarity with the information technologies and asking if they will share their knowledge and skills with the class.
- Using a word processor to develop class notes and editing a version to use as students’ handouts and a version for overhead transparencies.
- Using computer programs for keeping records in large class-enrollment lists, test items and so on and having students review and update their own record from time to time.
- Using different packages for data analysis
- Encouraging students to include visual elements as part of their projects.
- Spending students’ time as a multimedia workstation, planning a presentation; assembling projection graphics, video clips, animation, sound and other materials; trying to match particular materials with specific learning objectives; and integrating the materials into a unified presentation.
- Eliminating and/or minimizing physical problems arising from the use of information technologies.
Conclusion

Information technologies are the result of knowledge explosion. These include hardware & software technologies and facilitate teaching learning process. Using Information Technologies learners are now able to participate in learning communities throughout the world. They are independent and free in choice of their programmes of study and access to the resources. They may learn collaboratively, share information, exchange their learning experiences and work through cooperative activities in virtual learning communities. Information technologies facilitate teaching learning process in more productive fashion. Similarly, the role of teacher is also different in new settings than in the conventional system. Teacher facilitates and guides the learners in their study playing the role of a coach or mentor. Now teacher is not at the center of the instruction and sole source of information as in conventional classrooms. He/she decides contents/experiences and/or activities, locates the resources and guides learners how to have access and utilize the information for required outcomes. In nutshell, information technologies are restructuring teaching learning process to meet the International standards.

ACADEMIC SERVICES

INFLIBNET

Information and Library Network (INFLIBNET) Centre is an Autonomous Inter-University Centre (IUC) of University Grants Commission, Government of India, involved in creating infrastructure for sharing of library and information resources and services among Academic and Research Institutions. INFLIBNET works collaboratively with Indian university libraries to shape the future of the academic libraries in the evolving information environment.

It is a major National Programme initiated by the UGC in 1991 with its Head Quarters at Gujarat University Campus, Ahmedabad. Initially started as a project under the IUCAA, it became an independent Inter-University Centre in 1996. INFLIBNET is involved in modernizing university libraries in India and connecting them as well as information centres in the country through a nationwide high speed data network using the state-of-art technologies for the optimum utilisation of information. INFLIBNET is set out to be a major player in promoting scholarly communication among academicians and researchers in India.

Objectives

The primary objectives of INFLIBNET are:

To promote and establish communication facilities to improve capability in information transfer and access, that provide support to scholarship, learning,
research and academic pursuit through cooperation and involvement of agencies concerned.

To establish INFLIBNET: Information and Library Network a computer communication network for linking libraries and information centres in universities, deemed to be universities, colleges, UGC information centres, institutions of national importance and R & D institutions, etc. avoiding duplication of efforts.

EVENTS

- E-resources User Awareness Training Programme held on Nov. 25, 2009 in Gujarat University, Ahmedabad.
- E-resources User Awareness Training Programme held on Nov. 26, 2009 in North Gujarat University, Patan (Gujarat).
- 81st SOUL 2.0 Training program on Software Installation & Operations at INFLIBNET Centre, Ahmedabad from 9th to 13th November, 2009 at INFLIBNET Centre, Ahmedabad
- INFLIBNET Regional Training Programme on Library Automation (IRTPLA) held at DLIS, University of Kashmir, Srinagar from 16th - 20th November, 2009
- INFLIBNET Regional Training Programme on Library Automation (IRTPLA) held at University of North Bengal, Siliguri from 14th - 18th December, 2009
- PLANNER 2010: Promotion of Library Automation and Networking in North Eastern Region held on February 18-20, 2010 at Tezpur University, Assam.
- Attachment Training Programme for Practicing Librarians and Computer Professionals of North Eastern Region

Functions

In order to fulfill the broad objectives, INFLIBNET will do the following:

Promote and implement computerisation of operations and services in the libraries and information centres of the country, following a uniform standard.

Evolve standards and uniform guidelines in techniques, methods, procedures, computer hardware and software, services and promote their adoption in actual practice by all libraries, in order to facilitate pooling, sharing and exchange of information towards optimal use of resources and facilities.

Evolve a national network interconnecting various libraries and information centres in the country and to improve capability in information handling and service.
Provide reliable access to document collection of libraries by creating on-line union catalogue of serials, theses/dissertations, books, monographs and non-book materials (manuscripts, audio-visuals, computer data, multimedia, etc.) in various libraries in India.

Provide access to bibliographic information sources with citations, abstracts etc. through indigenously created databases of the Sectoral Information Centres of NISSAT, UGC Information Centres, City Networks and such others and by establishing gateways for on-line accessing of national and international databases held by national and international information networks and centres respectively.

Develop new methods and techniques for archival of valuable information available as manuscripts and information documents in different Indian Languages, in the form of digital images using high density storage media.

Optimise information resource utilization through shared cataloguing, inter-library loan service, catalogue production, collection development and thus avoiding duplication in acquisition to the extent possible.

Enable the users dispersed all over the country, irrespective of location and distance, to have access to information regarding serials, theses/dissertations, books, monographs and non-book materials by locating the sources wherefrom available and to obtain it through the facilities of INFLIBNET and union catalogue of documents.

Create databases of projects, institutions, specialists, etc. for providing on-line information service.

Encourage co-operation among libraries, documentation centres and information centres in the country, so that the resources can be pooled for the benefit of helping the weaker resource centres by stronger ones.

Train and develop human resources in the field of computerised library operations and networking to establish, manage and sustain INFLIBNET.

Facilitate academic communication amongst scientists, engineers, social scientists, academics, faculties, researchers and students through electronic mail, file transfer, computer/audio/video conferencing, etc.

Undertake system design and studies in the field of communications, computer networking, information handling and data management.

Establish appropriate control and monitoring system for the communication network and organise maintenance.
Collaborate with institutions, libraries, information centres and other organisations in India and abroad in the field relevant to the objectives of the Centre.

Create and promote R&D and other facilities and technical positions for realising the objectives of the Centre.

Generate revenue by providing consultancies and information services.

Do all other such things as may be necessary, incidental or conducive to the attainment of all or any of the above objectives.

Dr. Jagdish Arora is the Director of The Centre as on date.

**NIC, the premier ICT organization of Govt of India**

National Informatics Centre (NIC) is a premier S & T institution of the Government of India, established in 1976, for providing e-Government / e-Governance Solutions adopting best practices, integrated services and global solutions in Government Sector. In 1975, the Government of India strategically decided to take effective steps for the development of information systems and utilization of information resources and also for introducing computer based decision support system (informatics-led development) in government ministries and departments to facilitate planning and programme implementation to further the growth of economic and social development. Following this, the Central Government nucleated a high priority plan project "National Informatics Centre (NIC)" in 1976, and later on with the financial assistance of the United Nations Development Programme (UNDP) to the tune of US$4.1 million

**National Informatics Centre (NIC) ICT for better governance**

We live in the age of the Information Technology (IT) revolution. The universal acceptance of the power of IT to transform and accelerate the development process, especially in developing economies is indisputable. The rapid advance of Communication technologies, especially the Internet, has enabled governments all over the world to reach out to their most remote constituencies to improve the lives of their most underprivileged citizens.

NIC, under the Department of Information Technology of the Government of India, is a premier Science and Technology organization, at the forefront of the active promotion and implementation of Information and Communication Technology (ICT) solutions in the government. NIC has spearheaded the e-Governance drive in the country for the last three decades building a strong foundation for better and more transparent governance and assisting the
governments endeavor to reach the unreached.

**Background**

The mid-1970s, in India, were watershed years, heralding a revolutionary transformation in governance. In the year 1975, the Government of India envisioned that the strategic use of Information Technology (IT) in government would lead to more transparent and efficacious governance which could give a fillip to all-round development. In 1976, in the wake of this recognition of the potency of IT, the Government visualized a project of enduring importance viz. the "National Informatics Centre (NIC)". Subsequently, with the financial assistance of the United Nations Development Program (UNDP) amounting to US $4.4 million, NIC was set up.

**Achievements**

- NIC has leveraged ICT to provide a robust communication backbone and effective support for e-Governance to the Central Government, State Governments, UT Administrations, Districts and other Government bodies. It offers a wide range of ICT services. This includes NICNET, a Nationwide Communication Network with gateway nodes at about 53 departments of the Government of India, 35 State/UT Secretariats and 603 District collectorates to service ICT applications. NICNET has played a pivotal role in decentralized planning, improvement in Government services, wider transparency of national and local Governments and improving their accountability to the people. NIC assists in implementing ICT projects, in close collaboration with Central and State Governments and endeavors to ensure that state-of-the-art technology is available to its users in all areas of ICT.

The milestones in NICs ICT based endeavors, over the years, have worked to fulfill the expectations with which it was established, as may be seen below.

**Milestones**

- Central Government Informatics Development Programme a strategic decision to overcome Digital Divide in Central Government Departments during the Fifth Plan Period (i.e. 1972-77);
- NICNET - A first of its kind in developing countries, using state-of-the-art VSAT technology. Gateway for Internet/Intranet Access and Resources Sharing in Central Government Ministries and Departments during 1980s and 1990s;
- IT in Social Applications and Public Administration;
State Government Informatics Development Programme a strategic decision to overcome Digital Divide in Central and State Governments/UT Administrations, during the Seventh Plan Period (i.e. 1985-1990);

DISNIC A NICNET based District Government Informatics Programme a strategic decision in 1985 to overcome the Digital Divide in the District Administrations;

Reaching out into India during 1985-90, even before the arrival of Internet Technology, to all the districts of the country, which is a land of diversity and different types of terrain, various Agro-climatic conditions, different levels of socio-economic conditions, and varied levels of regional development etc.

Video-Conferencing operations first commenced in the early 90s and now connect 490 locations

National Informatics Centre Services Inc. (NICSI) was set up in 1995, as a section 25 Company under National Informatics Centre. NICSI is preferred by government departments for outsourcing the entire range of IT solutions and services.

India Image Portal is a gateway to the Indian government information with a mission to extend comprehensive WWW services to Government Ministries and Departments Under this project, over 5000 Government of India websites are being hosted.

A significant outcome of India Image Portal, which came about in the early years of the millennium, is the GOI Directory, a first of its kind comprehensive directory providing information about websites of the Indian government at all levels.

Also, in late 2005, all the services and websites in India Image Portal were brought under one interface to provide single-window access to citizens. This is the National Portal accessible at http://india.gov.in.

Integrated Network Operations Centre (I-NOC) was established in 2002 for round the clock monitoring of all the WAN links across the country.

NIC Data Centre, established in 2002, hosts over 5000 websites & portals. Data Centres which have been established at State capitals for their local storage needs have storage capacity from 2-10 Tera Bytes.

NIC has been licensed to function as Certifying Authority (CA) in the G2G domain and CA services commenced in 2002.

NIC set up the Right to Information Portal in order to provide support to
the Government for speedy and effective implementation of the Right to Information Act 2005.

- Over the years NIC has extended the satellite based Wide Area Network to more than 3000 nodes and well over 60,000 nodes of Local Area Networks in all the Central Government offices and State Government Secretariats.

As a major step in ushering in e-Governance, NIC implements the following minimum agenda as announced by the Central Government:

- Internet/Intranet Infrastructure (PCs, Office Productivity Tools, Portals on Business of Allocation and Office Procedures)
- IT empowerment of officers/officials through Training
- IT enabled Services including G2G, G2B, G2C, G2E portals
- IT Plans for Sectoral Development
- Business Process Re-engineering

NIC provides a rich and varied range of ICT services delineated below.

Profile of Current Services:

- Digital Archiving and Management
- Digital Library
- E-Commerce
- E-Governance
- Geographical Information System
- IT Training for Government Employees
- Network Services (Internet, Intranet)
- Video Conferencing
- Web Services
- General Informatics Services
- Medical Informatics
- Bibliographic Services
- Intellectual Property and Know-How Informatics Services
- Setting up of Data Centres
- Building Gigabit Backbone
Thus, NIC, a small program started by the external stimulus of an UNDP project, in the early 1970s, became fully functional in 1977 and since then has grown with tremendous momentum to become one of India’s major S&T; organizations promoting informatics led development. This has helped to usher in the required transformation in government to ably meet the challenges of the new millennium

**Services**

NIC is a Premier Information Technology Organisation in India providing State_of_Art Solutions for Information Management and Decision Support in Government and Corporate Sector. A number of Services are being provided by NIC to all the Government Ministries/Departments/States/Districts.

NIC is providing network backbone and e-Governance support to Central Government, State Governments, UT Administrations, Districts and other Government bodies. It offers a wide range of ICT services including Nationwide Communication Network for decentralised planning, improvement in Government services and wider transparency of national and local Governments.

NIC assists in implementing Information Technology Projects, in close collaboration with Central and State Governments, in the areas of (a) Centrally sponsored schemes and Central sector schemes, (b) State sector and State sponsored projects, and (c) District Administration sponsored projects. NIC endeavours to ensure that the latest technology in all areas of IT is available to its users. It is one of the total solution providers to the Government and is actively involved in most of the IT enabled applications and has changed the mindset of the working community in the Government to make use of the latest state of the art technology in their day to day activities to provide better services to the citizens.

**NICNET**

National Informatics Centre (NIC) is a premier organisation in the field of Information Technology (IT) in India. It provides state of the art solutions to the information management and decision support requirements of the Government and the corporate sector. NIC has set up a satellite-based nation-wide computer-communication network, called NICNET, with over 700 nodes connecting the national capital, the state capitals and district headquarters to one and another.

**IT services by NIC:**
The IT services provided by NIC are: Conducting feasibility studies for computerisation; Designing; Developing and Implementing computer-based information systems; to undertaking large turnkey projects.

NIC is having highly skilled pool of manpower numbering more than 3000

NIC has extensive software development capabilities in the areas of databases, computer aided design, networking, geographic information systems, analytical modeling, expert systems, telematics, multimedia etc.

It has developed over 3000 databases in various sectors such as Education, Health, Transport, Agriculture etc.

NIC has been instrumental in processing very large volumes of data related to the 1991 Population Census and Industrial Census.

NIC has also developed a number of network-based applications; most notable are General Elections in India.

Developing & hosting of Web sites of Govt. Office (Central/State) as well as of private organisation, Eduactional, Research Institutes etc. on NIC Web Servers.

**NICNET FACILITIES:**

NICNET was designed and implemented by NIC using state-of-the-satellite-based computer-communication technology. Keeping in view the wide geographic spread of the country, ranging from islands in Indian ocean to the highest Himalayan ranges, in design of NICNET, which is one of the largest VSAT networks of its kind in the world, ensures extremely cost effective and reliable implementation.

NICNET has now become an integral part of a large number of Government and Corporate sector organisations, providing information exchange services. NICNET services include File Transfer, Electronic Mail, Remote Database Access, Data broadcast and EDI. In times of natural calamities like cyclones, NICNET has served as the basic message communication facility in the calamity-affected areas. A large number of users including banks, financial institutions, exporters, ports and custom houses are targeted for provision of EDI services on NICNET. NICNET provides gateway to International Networks for Electronic Mail, Database Access and EDI services.

**BRNet**
Bio-Resource Network (BRNet) is a prototype portal site for biological information. BRNet provides catalogue information, deposit organization information and you can order Bio-Resource you search through BRNet. BRNet system provides not only the way you get, search Bio-Resource and its related information and classify, identifies your Bio-Resource but how you construct your own DB for Bio-Resource you have. It is indispensable for new approaches to and integrated analysis of life phenomena to construct a network of the biological information that are distributed worldwide.

FREE SOFTWARE

The free software definition presents the criteria for whether a particular software program qualifies as free software. From time to time we revise this
definition, to clarify it or to resolve questions about subtle issues. See the History section below for a list of changes that affect the definition of free software.

“Free software” means software that respects users’ freedom and community. Roughly, the users have the freedom to run, copy, distribute, study, change and improve the software. With these freedoms, the users (both individually and collectively) control the program and what it does for them. When users don’t control the program, the program controls the users. The developer controls the program, and through it controls the users. This nonfree or “proprietary” program is therefore an instrument of unjust power.

Thus, “free software” is a matter of liberty, not price. To understand the concept, you should think of “free” as in “free speech,” not as in “free beer”. A program is free software if the program’s users have the four essential freedoms:

- The freedom to run the program, for any purpose (freedom 0).
- The freedom to study how the program works and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

A program is free software if users have all of these freedoms. Thus, you should be free to redistribute copies, either with or without modifications, either gratis or charging a fee for distribution, to anyone anywhere. Being free to do these things means (among other things) that you do not have to ask or pay for permission to do so.

You should also have the freedom to make modifications and use them privately in your own work or play, without even mentioning that they exist. If you do publish your changes, you should not be required to notify anyone in particular, or in any particular way.

The freedom to run the program means the freedom for any kind of person or organization to use it on any kind of computer system, for any kind of overall job and purpose, without being required to communicate about it with the developer or any other specific entity. In this freedom, it is the user’s purpose that matters, not the developer’s purpose; you as a user are free to run the program for your purposes, and if you distribute it to someone else, she is then
free to run it for her purposes, but you are not entitled to impose your purposes on her.

The freedom to redistribute copies must include binary or executable forms of the program, as well as source code, for both modified and unmodified versions. (Distributing programs in runnable form is necessary for conveniently installable free operating systems.) It is OK if there is no way to produce a binary or executable form for a certain program (since some languages don’t support that feature), but you must have the freedom to redistribute such forms should you find or develop a way to make them.

In order for freedoms 1 and 3 (the freedom to make changes and the freedom to publish improved versions) to be meaningful, you must have access to the source code of the program. Therefore, accessibility of source code is a necessary condition for free software. Obfuscated “source code” is not real source code and does not count as source code.

Freedom 1 includes the freedom to use your changed version in place of the original. If the program is delivered in a product designed to run someone else’s modified versions but refuse to run yours — a practice known as “tivoization” or “lockdown”, or (in its practitioners’ perverse terminology) as “secure boot” — freedom 1 becomes a theoretical fiction rather than a practical freedom. This is not sufficient. In other words, these binaries are not free software even if the source code they are compiled from is free.

One important way to modify a program is by merging in available free subroutines and modules. If the program’s license says that you cannot merge in a suitably licensed existing module — for instance, if it requires you to be the copyright holder of any code you add — then the license is too restrictive to qualify as free.

Freedom 3 includes the freedom to release your modified versions as free software. A free license may also permit other ways of releasing them; in other words, it does not have to be a copyleft license. However, a license that requires modified versions to be nonfree does not qualify as a free license.

In order for these freedoms to be real, they must be permanent and irrevocable as long as you do nothing wrong; if the developer of the software has the power to revoke the license, or retroactively add restrictions to its terms, without your doing anything wrong to give cause, the software is not free.

However, certain kinds of rules about the manner of distributing free software are acceptable, when they don’t conflict with the central freedoms. For example, copyleft (very simply stated) is the rule that when redistributing the
program, you cannot add restrictions to deny other people the central freedoms. This rule does not conflict with the central freedoms; rather it protects them.

“Free software” does not mean “noncommercial”. A free program must be available for commercial use, commercial development, and commercial distribution. Commercial development of free software is no longer unusual; such free commercial software is very important. You may have paid money to get copies of free software, or you may have obtained copies at no charge. But regardless of how you got your copies, you always have the freedom to copy and change the software, even to sell copies.

Whether a change constitutes an improvement is a subjective matter. If your modifications are limited, in substance, to changes that someone else considers an improvement that is not freedom.

However, rules about how to package a modified version are acceptable, if they don’t substantively limit your freedom to release modified versions, or your freedom to make and use modified versions privately. Thus, it is acceptable for the license to require that you change the name of the modified version, remove a logo, or identify your modifications as yours. As long as these requirements are not so burdensome that they effectively hamper you from releasing your changes, they are acceptable; you’re already making other changes to the program, so you won’t have trouble making a few more.

A special issue arises when a license requires changing the name by which the program will be invoked from other programs. That effectively hampers you from releasing your changed version so that it can replace the original when invoked by those other programs. This sort of requirement is acceptable only if there’s a suitable aliasing facility that allows you to specify the original program’s name as an alias for the modified version.

Rules that “if you make your version available in this way, you must make it available in that way also” can be acceptable too, on the same condition. An example of such an acceptable rule is one saying that if you have distributed a modified version and a previous developer asks for a copy of it, you must send one. (Note that such a rule still leaves you the choice of whether to distribute your version at all.) Rules that require release of source code to the users for versions that you put into public use are also acceptable.

In the GNU project, we use copyleft to protect these freedoms legally for everyone. But noncopylefted free software also exists. We believe there are important reasons why it is better to use copyleft, but if your program is noncopylefted free software, it is still basically ethical. (See Categories of Free
Software for a description of how “free software,” “copylefted software” and other categories of software relate to each other.)

Sometimes government export control regulations and trade sanctions can constrain your freedom to distribute copies of programs internationally. Software developers do not have the power to eliminate or override these restrictions, but what they can and must do is refuse to impose them as conditions of use of the program. In this way, the restrictions will not affect activities and people outside the jurisdictions of these governments. Thus, free software licenses must not require obedience to any export regulations as a condition of any of the essential freedoms.

Most free software licenses are based on copyright, and there are limits on what kinds of requirements can be imposed through copyright. If a copyright-based license respects freedom in the ways described above, it is unlikely to have some other sort of problem that we never anticipated (though this does happen occasionally). However, some free software licenses are based on contracts, and contracts can impose a much larger range of possible restrictions. That means there are many possible ways such a license could be unacceptably restrictive and nonfree.

We can’t possibly list all the ways that might happen. If a contract-based license restricts the user in an unusual way that copyright-based licenses cannot, and which isn’t mentioned here as legitimate, we will have to think about it, and we will probably conclude it is nonfree.

When talking about free software, it is best to avoid using terms like “give away” or “for free,” because those terms imply that the issue is about price, not freedom. Some common terms such as “piracy” embody opinions we hope you won’t endorse. See Confusing Words and Phrases that are Worth Avoiding for a discussion of these terms. We also have a list of proper translations of “free software” into various languages.

Finally, note that criteria such as those stated in this free software definition require careful thought for their interpretation. To decide whether a specific software license qualifies as a free software license, we judge it based on these criteria to determine whether it fits their spirit as well as the precise words. If a license includes unconscionable restrictions, we reject it, even if we did not anticipate the issue in these criteria. Sometimes a license requirement raises an issue that calls for extensive thought, including discussions with a lawyer, before we can decide if the requirement is acceptable. When we reach a conclusion about a new issue, we often update these criteria to make it easier to see why certain licenses do or don’t qualify.
If you are interested in whether a specific license qualifies as a free software license, see our list of licenses. If the license you are concerned with is not listed there, you can ask us about it by sending us email at <licensing@gnu.org>.

If you are contemplating writing a new license, please contact the Free Software Foundation first by writing to that address. The proliferation of different free software licenses means increased work for users in understanding the licenses; we may be able to help you find an existing free software license that meets your needs.

If that isn’t possible, if you really need a new license, with our help you can ensure that the license really is a free software license and avoid various practical problems.

**Beyond Software**

Software manuals must be free, for the same reasons that software must be free, and because the manuals are in effect part of the software. The same arguments also make sense for other kinds of works of practical use — that is to say, works that embody useful knowledge, such as educational works and reference works. Wikipedia is the best-known example. Any kind of work can be free, and the definition of free software has been extended to a definition of free cultural works applicable to any kind of works.

**Questions**

1. What is DOS?
2. Explain the importance of windows.
3. What is Internet?
5. What are the Basic concepts of IPR?
6. What is INFLIBNET?
7. Explain the significance of BRNET.
UNIT-III

COMPUTER APPLICATIONS AND IMPACT OF ICT

Word processing

Word processing is the creation of documents using a word processor. It can also refer to advanced shorthand techniques, sometimes used in specialized contexts with a specially modified typewriter. The term was coined at IBM’s Boeblingen, West Germany (at that time) Laboratory in the 1960s.

Spreadsheets

A spreadsheet, also known as a worksheet, contains rows and columns and is used to record and compare numerical or financial data. Originally, spreadsheets only existed in paper format, but now they are most likely created and maintained through a software program that displays the numerical information in rows and columns. Spreadsheets can be used in any area or field that works with numbers and are commonly found in the accounting, budgeting, sales forecasting, financial analysis, and scientific fields.

Computerized spreadsheets mimic a paper spreadsheet. The advantage of using computerized spreadsheets is their ability to update data and perform automatic calculations extremely quickly. On a computerized spreadsheet, the intersection of a row and a column is called a cell. Rows are generally identified by numbers - 1, 2, 3, and so on - and columns are identified by letters, such as A, B, C, and so on. The cell is a combination of a letter and a number to identify a particular location within the spreadsheet, for example A3.

To maneuver around the spreadsheet, you use the mouse or the tab key. When the contents of one cell are changed, any other affected cell is automatically recalculated according to the formulas in use. Formulas are the calculations to be performed on the data. Formulas can be simple, such as sum or average, or they can be very complex. Spreadsheets are also popular for testing hypothetical scenarios.

Setting up a spreadsheet can be fairly time consuming, although templates, or sample spreadsheets, are available with most software packages. The computerized spreadsheet can be formatted with titles, colors, bold text, and italics for a professional look. You can also create graphs and charts based on the data entered in your spreadsheet. Many packages have the ability to print mailing lists or labels.
The original computerized spreadsheet software was VisiCalc, designed for use on Apple computers. Now many commercial computerized software packages are available for Microsoft Windows and other operating systems. Popular spreadsheet packages include Microsoft Excel and Lotus 123.

Individuals, in addition to businesses, use computerized spreadsheet software for a variety of tasks that involve numerical data. Teachers can store and average grades with a spreadsheet. Individuals can use a spreadsheet to track a personal budget or store sports team statistics. Spreadsheets are one of the most popular uses for personal computers.

**PowerPoint**

PowerPoint is a presentation graphics software tool. It provides users the easy ability to create professional-looking presentations. PowerPoint provides editing, outlining, drawing, graphing, and presentation management functions, in one convenient software package.

**PowerPoint -History**

The original version of PowerPoint was created by Thomas Rudkin and Dennis Austin of a company called Forethought. The first release in 1987 was called "Presenter", designed for the 4 year old Macintosh computer. It was soon renamed "PowerPoint" because of the problems with trademark and copyright issues. In August, Forethought was bought by Microsoft for $14M and became Microsoft's "Graphics Business Unit", which continued to focus further on the software.

PowerPoint improved dramatically with PowerPoint 97. Prior to PPT 97, presentations were linear, and always proceeded from one slide to the next. PowerPoint 97 allowed users to create transitions and special effects in a non-linear movie-like style. PowerPoint 2000 introduced a clipboard that held multiple objects. And then there was the Office Assistant, whose frequent unsolicited appearances in PowerPoint 97 as a cute animated paperclip annoyed many users.

**PowerPoint Operation**

PowerPoint presentations consist of a number of individual pages or "slides". The "slide" analogy is a reference to the slide projector. Slides may contain text, graphics, sound, movies, and other objects, which may be arranged freely. PowerPoint, however, facilitates the use of a consistent style in a presentation using a template or "Slide Master". The presentation can be printed, displayed live on a computer, or navigated through at the command of the
presenter. For larger audiences the computer display is often projected using a video projector. Slides can also form the basis of webcasts.

**Animations in PowerPoint**

PowerPoint provides three types of movements:

1. Entrance, emphasis, and exit of elements on a slide itself are controlled by what PowerPoint calls Custom Animations.
2. Transitions, on the other hand are movements between slides. These can be animated in a variety of ways.
3. Custom animation can be used to create small story boards by animating pictures to enter, exit or move.

PowerPoint’s benefits are debated. Its use in classroom lectures has influenced investigations of its effects on student grades and performance compared to lectures based on overhead projectors or traditional lectures. The effect on audiences of ugly PowerPoint presentations has been described as Death by PowerPoint.

**Social impact of PowerPoint**

Although PowerPoint has benefits, many argue that PowerPoint has had a negative impact on society. Some large companies’ government branches use PowerPoint as a way to brief employees on critical issues. But opponents of PowerPoint say that reducing complex issues to bulleted points is detrimental to the decision making process; in other words, because the amount of data in a presentation must be consolidated, watching a PowerPoint presentation doesn’t provide enough detail to make a truly informed decision.

**Microsoft Access**

Microsoft Office Access, previously known as Microsoft Access, is a database management system from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the Professional and higher editions or sold separately. On May 12, 2010, the current version of Microsoft Access 2010 was released by Microsoft in Office 2010; Microsoft Office Access 2007 was the prior version.

MS Access stores data in its own format based on the Access Jet Database Engine. It can also import or link directly to data stored in other applications and databases.

Software developers and data architects can use Microsoft Access to develop application software, and "power users" can use it to build software.
applications. Like other Office applications, Access is supported by Visual Basic for Applications, an object-oriented programming language that can reference a variety of objects including DAO (Data Access Objects), ActiveX Data Objects, and many other ActiveX components. Visual objects used in forms and reports expose their methods and properties in the VBA programming environment, and VBA code modules may declare and call Windows operating-system functions.

**Desk Top Publishing (DTP)**

Desk Top Publishing describes the way text and graphics can be combined together on a single page which can then be printed out as a high quality print. It is a desk top because one person can do the work in one place instead of needing several people all over the place.

Before Desk Top Publishing (dtp) was invented, personal computer print quality was usually poor and pictures were very difficult to produce. Posters would be produced by cutting a stencil by hand and screen printing. Newspapers would be typed into machines which produced blocks of metal type and pictures on metal plates were added only at the last stage before printing.

Few people saw the text and graphics together until it was printed. It was a giant step forward to have text and graphics combined from the beginning, so you could see them on screen at your own desk top computer before printing them on a laser printer which was quick and easy due to toner cartridge technology, which was quick and easy due to toner cartridge technology. When printing at home, especially on an ink jet printer, make sure you have plenty of printer ink.

Today we are used to text and graphics together and seeing clever effects where text takes different shapes, wrap round graphics or follow a line along a path. However combining text and graphics in a single program is still the most important feature which makes a Desk Top Publishing program different from a Word Processor and a Graphics program.

There are very many different dtp programs, including programs like Microsoft Publisher, and professional programs like In Design and Quark Express. These will make it easy for you to take text saved elsewhere, a graphic saved from another program and combine them together.

Usually they have simple Draw tools so you can draw boxes, circles, borders etc and simple text tools so you can write fairly short pieces or edit text saved elsewhere. Although some people do a great deal of their writing in dtp it is generally more useful to write with a word processor, save the text then import it into the dtp program. That way you have a copy of the text which you can use in
Web pages, essays, almost anywhere, whereas having the text in the dtp program means you have to export it, which is more difficult.

Writing first into a Word Processor means you have the specialist word processing functions such as spell check, word count and so on, which you do not always find in dtp. The same goes for graphics. A specialist graphics program will give you specialist paint and draw tools which a dtp program doesn't usually provide. So let's summarise the strengths and weaknesses of dtp:

**DTP is good for:**

* combining text and graphics
* importing text and graphics created elsewhere
* creating columns of text

**DTP is not best for:**

* long or specialised writing tasks
* specialised graphics tasks
* exporting text and graphics

**Favourite dtp tasks include:**

* writing brochures, booklets with diagrams, newspapers, magazines, posters.

We are going to do some work producing these publications, starting with an invitation then a poster and working up to a newspaper. Today this is quite easy to do - but don't forget that historically dtp is quite new. What you will produce quite quickly today would have taken a skilled man many hours with old technology.

**Task One - Combining Text and Graphics**

Open a new dtp file and make one new text box and one new picture box. Copy the three paragraphs above ("DTP is good for", "DTP is not best for" and "Favourite dtp tasks include") into the dtp text box and copy the picture of metal type from the top of this page into the dtp picture box. Experiment with different type sizes and styles, change the size of the picture and its box (click on the picture and drag out one of the little "hooks" but try holding down a key such as "shift" or "control" to keep the picture in proportion instead of stretching it. Save the file when you are happy that the text and graphics go well together.
FIELDS OF INFLUENCE

IT has already entered into all areas of our social life. A brief discussion about the major fields of influence would give you some idea about the emerging trends. The concept of E-governance which is still at the starting point, will turn to be the most significant contribution that will sway the life of all Indians disregarding their class, creed and politics. Though late to officially introduce the utilities of IT, State of Kerala is also prepared to share some of these strategies implemented by the agencies like National Informatics Centre (NIC) and the National Association of Software and Service Companies (NASSCOM) which is the apex representative body of the IT industry in India. The SMART is such a package aimed to provide Simple, Moral, Accountable, Responsible, and Transparent governance.

You have already become the customers of computerized railway reservation and you are familiar with the unique Permanent Account Number (PAN) allotted to the income tax payers, the online services related to Indian Passport and driving licence. The University of Calicut has already registered your matriculation details and photograph online through the college office and a unique ID is generated for the purpose of your examinations. After the examination your results are made available on the website of the University, and by SMS to your mobile instruments even though it is not supposed to be used in the campus for the present. India, the world’s largest democratic country, has made it mandatory to maintain Photo Electoral Rolls. Therefore you have got the Electors Photo Identity Card which entitles you to cast your vote. You had the opportunity to enjoy this constitutional right at least once, that too in an Electronic Voting Machine. Directly or indirectly all these reforms have been supported by IT.

HEALTH

The field of healthcare committed to continuous improvement of life supporting services, also takes advantages of information technology. Various digital medical equipment is widely used for diagnosing illness, monitoring medical conditions and conducting treatment, including surgery. Most of the devices, including life-support installations, designed and manufactured by medi-IT are cosily dedicated instruments maintaining precision and safety standards of higher level.

The x-ray machines, Ultrasound and MRI scanners and CT scanners are the most popular diagnostic instruments supported by digital technology. These modern computerized imaging techniques can reveal a 3D image of internal organs. Medical lasers, surgical machines, infusion pumps etc. belong to the
group of equipment used for treatment. The life-support equipment like medical ventilators, anaesthetic instruments, heart lung machines and dialysis machines also have been reshaped for better performance and flexibility. Various types of monitoring gadgets used to track functions of vital organs and medical condition of the patient by analyzing ECG, EEG, blood pressure and many other routine examinations. Besides supporting the manufacture of tools and instruments, IT also supports the research and production of medicines.

It is common now, to network the digital medical equipment ranging from the handheld diagnostic apparatuses to highly sophisticated CT scanners through monitoring gadgets in speciality hospitals. All these instruments, their connectivity and interface etc. are invariably supported by pre-installed software. Besides this, there are lots of need-based software/ programs run in the PCs of medical practitioners and researchers. All these advances practically manifest the breakthrough achieved by the specialized professionals in the Medi-IT field. We are not going to the details of the bearing of IT in this field since our purpose is only to inculcate a generic level knowledge on these developments.

Coming to the social implications of the impact of ICT on healthcare and health information management, it appears that the faster development of IT, rendering cheaper communication services, was not comparable to the impact of IT in the field of health care. Some are of the opinion that the medical gadgets are highly expensive and the increased information resulted in the proliferation of files leading to problems of computation and storage in hospitals. Since doctors are often busy with their routine duties, a back-office team has to handle the accumulated data. It is well known that the medical domains deal with lot of transcription data. There are thousands of health journals. All these show that there is considerable increase in medical informatics and open access to many reputed medical sites have increased efficiency and quality in healthcare?

Are there enough trained personal to make the new gadgets work? How many doctors collect, keep and share data with improved ICT support? In short, the impact of IT is marked by the substantial increase of health information and the introduction of many sophisticated instruments. It is a fact that medi-IT has brought about many new facilities for diagnosis and life saving strategies. However, the cost of these services is continuously oncreasing. The most important aspect of impact of IT in the field of health are;

1. All patients, disregarding their social and economic status, have access to medical information any time from any place.

2. State of the art IT devices support testing/diagnostic and therapeutic procedure.
3. Many of these facilities are available in local centres so that there is no need to transport the patients to distant places.

4. The qualitative improvement of the health care is well manifested in areas like cardiology, eye care and surgery.

5. Audio video medical data is sent to experts stationed in far away centres for evaluation.

6. Medical education, involving standard learning materials, is another major area where IT has demonstrated greater possibilities.

7. Preventive and health promotion campaigns against issues like AIDDS, tobacco/drug abuse and diabetes are effectively launched on the Web by government, WHO and many NGO organizations.

Technological advances in medical field had universality helped reduction of cost of manufacture of certain vaccines or medicines. But treatment to many diseases are now administered by long-term medication. At the same time advances in the medical field, though not cost effective, offer life saving procedures which were previously impossible to treat scientifically. This is substantiated by the increase in the longevity and decrease in child mortality.

A research paper entitled “Technological Change and the Growth of Health Care Spending”, published by the Congress of the United States Congressional Budget Office, January 2008 at www.cbo.gov shows that the rising health care costs constitute the principal challenge of fiscal policy of the US government. Medical expenses paid by individuals also show similar growth in costs resulting in lesser saving. In this context the study emphasis the greatly expanded capabilities of medicine brought about by technological advances over the past several decades as the largest single factor responsible for the growth in spending. Growth rate of this rapidly increasing expenditure on healthcare begun nearly four decades ago is higher than the growth rate of US economy. This trend almost tripled the share of national income reserved for healthcare. This has now come to affect all parts of the health system as well as the overall economy including the welfare segments like public insurance programs. Impact of this trend is an eye opener especially to all developing nations.

COMMUNICATION

Rich or poor, politician or professor, reading a newspaper is almost a morning ritual for millions of people. All the mainstream news media houses have picked up information technology rather fast because it is of higher utility to them to store, restore, create and distribute knowledge for everyone everywhere. The IT revolution is shaping a new generation of journalism for the
With the onset of information Revolution, digital media has entered into our offices and homes. Just watch TV or Web reports of big political, cultural or ritual events. The amount of data accessible to the public is tremendous when compared to a printed pamphlet on the event. More fresh data at every recast and more and more updating at every moment make you closer to the incident live and real. Print media give you the entire story in a frozen frame. You can repeatedly read and enjoy its literary merit. But you have to patiently wait for the next day morning, at least to get another update.

Anyhow, ICT has contributed greatly to improve the newspaper industry. The journalists now have a chance to really know and interact with their readers. This close interaction goes beyond the traditional letters to the editor or the post-box. The IT enabled mass communication is unbounded by time and space. The traditional communication agencies like newspapers, magazines, television and radio run on the basis of ‘one-to-many’ principles are gradually transformed into ‘Many-to-many’ concept of publication. Zoned editions of newspapers are best examples for this model.

Movable printing press had set out a revolution in information and literacy. It empowered the people to educate themselves. The new technology challenges the dominance of heavily invested traditional mass media. Some of the farsighted editors and publishers have recognized the inestimable digital and started airing softcopy versions of their publications. They have even ventured to put up their own interactive web sites or started collaborating with television channels. This mutual compatibility enhanced the quality and quantity of information that newspapers can now make available. They can now maintain news archives and use supporting multimedia clips, for e-paper. This has improved the quality of information they handled. Research oriented reporting, investigative stinger operations, state-of-the-art analyses and opinion polls have become sensational ingredients. Naturally, young people prefer the sophisticated digital media.

There are still many who prefer eyeful silent reading of a newspaper rather than depending on the animated online clips. As Jon Katz, a media critic, said “they take away what’s best about reading a paper and don’t offer what’s best about being online.” This is true about most of the online news media. It is a fact that unless the newspapers reinvent themselves to adapt new futuristic models it will be difficult for them to maintain the readership.

**TRANSPORT**

We have briefly indicated the impact of locomotion on British India. Impact of IT on modern transport is largely seen in the form of various applications for
traffic control systems. The science of meteorology is greatly enriched by IT and it is now possible to observe and predict the varying weather conditions all over the globe almost certainly. Unlike the fantasies of early humans the outputs of the new science have become highly dependable. One major sector which inevitably uses the meteorological analysis is transport. Whether it is war flights or passenger carriers the aeroplanes cannot take off or ground safely without the digital tabulations of weather conditions. Water transport and the routine fishing activities now depend on the warning signals or clearance from the weather forecasts on the basis of observations supported by IT.

Until the first quarter of the 20th century, practitioners of physics and mathematics, aided by statistics, worked together on this discipline. Available technical gadgets were not capable of computing the global data on ever changing direction of winds, levels of tides, thundering rains or the extremes of insolation. However, the recent changes brought about by the advent of computers and various applications of the information technology in this field are incredible. Meteorology has been recognized as a stand-alone branch of science offering rapid and emergent services without compromising precision and accuracy. Another major traffic-control system is supported by the Global Positioning system (GPS) which was originally developed for military navigation. Railway signals and tracking controls largely makes use of the GPS. Location of trains on the rails help the computers implement Positive Train Separation (PTS) i.e. controlling the distances between two fast running trains on the same line.

The same principle and technique are developed and used for the control of traffic on the air, sea and network of highways. New cars are going to have what is known as intelligent transportation systems which receive location data and navigation information from satellites. It should be noted that such tracking and control systems are largely responsible for the comparatively lesser rate of traffic accidents in the wake of ever-growing traffic density. Through the foregoing discussion you might have noted that the impact of ICT on these selected areas is not evenly distributed.

VISUAL MEDIA

You have already read about Word Processors, Desktop Publishing the changes that are taking place on news media. Now we may turn to E-publishing which is a significant component of the visual media. The digitizing of information has created a vast expansion in the amount of information that is readily available to global audiences. Books and manuscripts that previously occupied the space of libraries and publishing houses are now kept in digital form that can travel vast distances at rapid speed. In other words, more information is available to more people more quickly than ever before.
E-publishing

E-publishing is short for electronic publishing, referring to a type of publishing that does not include printed books. E-publishing instead takes the format of works published online, on a compact disk, emailed, or provided in a file format compatible with handheld electronic readers. E-publishing is an alternate form of publication especially attractive to new writers. There is advantages and disadvantages to e-publishing over traditional printed books.

Some of the advantages of e-publishing include:

- Negligible investment by the publisher translates to a greater willingness to take on untried writers and non-traditional characters, story lines, and manuscript lengths.
- Faster publishing time for accepted manuscripts. Rather than waiting up to two years for a manuscript to see print, e-publishing generally publishes work within a few weeks to a few months after acceptance.
- Greater flexibility within the writer/publisher relationship. E-publishing affords more say to writers in preparing works for publication. A paper publisher might ask a writer to change a character, plot line, or other features of a story to make it more marketable. An e-publisher might also make suggestions, but the writer will generally have more say. The writer might also be instrumental in providing graphics for the work, such as an electronic jacket.
- Writers have the ability to update text often and easily at virtually no cost. This is particularly handy for works related to fast-moving industries such as computer technology. Since the e-publisher does not have an investment in printed books already lining shelves, text can be electronically updated in seconds.
- E-publishing offers greater longevity for works with slower sales. While paper publishers will remove slow movers from active status (print), electronic storage affords unlimited archiving. This gives new writers time to build a following by having their entire catalog available over extended periods of time.
- Works published electronically have an ISBN number, just like printed books. This means anyone can walk into a storefront bookstore and order an electronic copy of the book.
- Writers get a higher percentage of royalties through e-publishing because the initial financial layout for the publisher is so much less than for a
paper publisher. Some writers receive as much as 70% of the profits in royalties.

- With e-publishing writers normally retain all other rights to the work, such as the option to go to a paper publisher later, adapt a screenplay, or use the work in some other capacity. Paper publishers, on the other hand, tend to covet as many rights as possible from the writer in the initial boilerplate contract.

If this all sounds a little too rosy, note the disadvantages of e-publishing:

- To date, electronic works sell far fewer copies than paper books. Many people aren’t aware of e-publishing and others prefer reading a book from print rather than electronically. Good sales, according to one e-publisher, amount to 500 copies for a successful manuscript.

- Writers are responsible for providing their own ongoing marketing for e-published work. A book might be great, but if nobody knows about it, it won’t sell. Authors also can’t count on the public seeing their books on shelves or in store windows.

- If interested in building credentials, e-published works do not carry the same weight as traditional paper publishers. The sense is that the bar is somehow lower for e-published works than for printed works. However, this may change with time as e-publishing becomes more established.

- Writers do not receive an advance. This is not just a financial disadvantage, but might disqualify e-published authors from participating in certain organizations where membership requirements include works paid by advance. That said, sales royalties are often paid more frequently by e-publishers, such as quarterly rather than annually.

- Piracy is another concern in the e-publishing industry. It is a fairly simple thing, technically speaking, for a recipient of an e-work to edit the file, make several copies, and sell the work out from under the nose of the e-publisher and author. Some e-publishers counter that the relatively small market for e-works provides little impetus for this.

- Prices are not always significantly cheaper for e-works, despite the lower overhead. This might be a deterrent to sales.

Despite the disadvantages, e-publishing can be a good way for a new writer to gain a following. Romance, science fiction, murder mystery and fantasy are all possible genres for e-publishing. It is also ideal for How-To books that must be updated frequently. Businesses can also save money on employee manuals and training materials by e-publishing them. An added advantage here is that works
can be clickable. Table of contents and indexes can all make navigating through technical e-books a breeze.

E-publishers can be found online using any search engine. Read contracts carefully and consider the e-publisher’s catalog before deciding which company might be best to handle your work.

**E-book**

An *electronic book* (variously, *e-book*, *ebook*, *digital book*) is a book-length publication in digital form, consisting of text, images, or both, and produced on, published through, and readable on computers or other electronic devices. Sometimes the equivalent of a conventional printed book, e-books can also be born digital. The *Oxford Dictionary of English* defines the e-book as "an electronic version of a printed book," but e-books can and do exist without any printed equivalent. E-books are usually read on dedicated e-book readers. Personal computers and some mobile phones can also be used to read e-books.

**Electronic journals**

*Electronic journals*, also known as *ejournals*, *e-journals*, and *electronic serials*, are scholarly journals or intellectual magazines that can be accessed via electronic transmission. In practice, this means that they are usually published on the Web. They are a specialized form of electronic document: they have the purpose of providing material for academic research and study, and they are formatted approximately like journal articles in traditional printed journals. Being in electronic form, articles sometimes contain metadata that can be entered into specialized databases, such as DOAJ or OACI, as well as the databases and search-engines for the academic discipline concerned.

Some electronic journals are online-only journals; some are online versions of printed journals, and some consist of the online equivalent of a printed journal, but with additional online-only (sometimes video and interactive media) material.

Most commercial journals are subscription-based, or allow pay-per-view access. Many universities subscribe in bulk to packages of electronic journals, so as to provide access to them to their students and faculty. It is generally also possible for individuals to purchase an annual subscription to a journal, via the original publisher.

An increasing number of journals are now available as online open access journals, requiring no subscription and offering free full-text articles and reviews to all. Individual articles from electronic journals will also be found online for free in an ad-hoc manner: in working paper archives; on personal homepages; and in
the collections held in institutional repositories and subject repositories. Some commercial journals do find ways to offer free materials. They may offer their initial issue or issues free, and then charge thereafter. Some give away their book reviews section for free. Others offer the first few pages of each article for free.

Most electronic journals are published in HTML and/or PDF formats, but some are available in only one of the two formats. A small minority publishes in DOC, and a few are starting to add MP3 audio. Some early electronic journals were first published in ASCII text, and some informally published ones continue in that format.

EDUCATION

CONCEPTS OF WORLDWIDE CLASS ROOMS

In many circles Distance Learning is seen as an alternative to Classroom Instruction. Distance learning certainly addresses some of the limitations of classroom instruction, in particular the barriers of “at this time and in this place.” Distance learning can eliminate one or both, but not without its own costs. Here we will look at an ongoing effort at the University of Michigan–Flint to use distance learning to augment classroom instruction, and vice versa, in a room they call the Cyber Classroom. Using video, audio and lecture capture technology, presentations given in that room are automatically turned into recorded distance learning programs available to all the students on a multi-media website. We’ll see that students’ situations and learning styles vary widely and that having both classroom instruction and distance learning resources available to all students enrolled in a course improves student understanding of the course material as demonstrated by final grades.

The Cyber Classroom Technology

The Computer Science, Engineering and Physics department of the University of Michigan–Flint started making video recordings of lectures in 2007. They use Foveal Systems’ AutoAuditorium System1 as a front-end to Sonic Foundry’s Mediasite2, to capture class sessions for their students.

Each recording is automatically composed of shots of any projected material combined with a Tracking Camera shot of the professor walking around the front of the room, and an occasional shot from the back of the room. The AutoAuditorium System does the shot selection and composition while operating the Tracking Camera, changing pan, tilt and zoom settings as appropriate. If there is more than one person moving “on stage” the Tracking Camera zooms out to look at all of them. If there is only one person walking and gesturing, it zooms in enough to keep the person in frame. Someone calmly standing in one place results in a head-and-shoulders shot.
The audio of the class session comes from the wireless microphone the professor wears plus ceiling mounted microphones over the presentation area at the front of the room and over the student seating area. These are automatically mixed together so those watching the recordings can hear almost everything said in the room. The ceiling microphones over the stage are also a backup against a dead battery in the wireless microphone because audio from them is still good enough to provide continuous coverage. The room is small enough that everyone can hear without using the audio mix for in-room sound reinforcement.

The Mediasite Recorder captures, encodes and synchronizes the video, audio and projector feeds into a recorded presentation. Simple controls allow the professor to label, start, pause and end the recording of each class. The recording is available on the Mediasite Server’s Cyber Classroom catalog ten minutes after class ends. Since each set of recordings is addressed to a particular section of a particular course offering, the recordings are removed from the catalog after final exams.

The Cyber Classroom Student Experience

All the students signed up for a course given in the Cyber Classroom has access to all of the lectures as both inperson classroom instruction and distance learning recordings. Students don’t have to choose in advance between one or the other. Instead they are free to use both in any way that works for them. For a school with a large proportion of adult learners who live off-campus, are employed or have families, this arrangement provides those students with a great deal of flexibility. Their stories reflect the diversity in learning styles and instruction preference, from purely classroom to purely distant.

One student swore he never, ever watched the videos, “except this one time I didn’t understand something. I don’t know how many times I replayed that one section of that one recording, but I finally understood the concept.” Others would watch portions of almost every recording, ranging from a couple of short segments where they didn’t quite understand something to much longer sections to review before exams. A few students both came to class and watched the recordings in their entirety. One instructor tells of a student whose English was not very strong. “He came to every class, and then watched the recording with a friend who would translate and explain. In the end his English was much improved and he did well in the course.”

Another, handicapped student who could not take notes while attending class also watched the recordings in the dorm. Then there was the student that thought he could sleep late and just watch the video “but then discovered that he really wanted to ask questions and so started attending in person.” Another, who
found that sometimes the material was going by too fast, watched the recordings and made liberal use of the Pause button.

Of course there is the case where a business trip, weather or other event keeps a student from attending class. “I see the class I missed, with the same professor with the same body language and emphasis I’m used to, and the same students asking the same sorts of questions they always ask.” And there were a few who did not attend class at all because of work conflicts. For them the Cyber Classroom was Distance Learning.

**Measuring the Effectiveness of Cyber Classroom Instruction**

In 2008 Stephen Turner and Michael Farmer, both Cyber Classroom instructors, realized that they had a rare opportunity to make direct comparisons of student outcomes both without and with the Cyber Classroom recordings. Three professors who had taught the same courses for a number of years were now in the Cyber Classroom. Turner and Farmer compared 176 past students who attended 448 lectures against 173 students attending and/or watching 308 Cyber Classroom lectures. In their paper “Assessment of Student Performance in an Internet-Based Multimedia Classroom” they reported these comparisons of the final grades:

- the average of all grades went up nearly half a grade point, approximately C+ to B-
- the standard deviation of the grades improved by going down by about 10%
- 36% more students received honor grades, B+ and above, and
- 56% fewer students failed

“The significant drop in failing grades can directly be attributed to the integrated blending of on-line and inclass formats through the Cyber Classroom, since most failures in our students can be attributed to the students ‘vanishing’ for extended periods of the semester due to external problems and commitments. The Cyber Classroom allows these students to remain connected and participating in the class despite their sudden inability to come to class thus validating the concept of integrating on-line and distance learning for maximum flexibility in student participation.”

**The Administrative Viewpoint on the Cyber Classroom**

Chris Pearson is the department chair of the Computer Science, Engineering and Physics (CSEP) department.“All our graduate courses and many undergraduate courses are given in our Cyber Classroom. It is booked from 8 am until 9 pm on the four days a week we offer instruction. We make 22 recordings
each week.” “Since our removing the distinction between on-line and in-class instruction is primarily student-centered, we concluded that we needed a second room. Our decision was to just clone the first. We did not see the need to consider alternatives.” Their second Cyber Classroom was installed in the fall of 2010.

**Conclusions**

The Cyber Classroom is now an established fact of the CSEP Master Degrees. All of those courses are taught in the Cyber Classrooms and all the current masters students have had all their classes in those rooms. It is no longer possible to do a before-and-after comparison in this program.

We can say that the blending of traditional classroom instruction with distance learning technology can have a wide range of benefits for a variety of students. We can also expect that, in the future, the attributes currently thought of as Cyber in a Classroom setting will simply become “the classroom.”

**E-learning**

E-learning includes all forms of electronically supported learning and teaching, and more recently Edtech. The information and communication systems, whether networked learning or not, serve as specific media to implement the learning process. The term will still most likely be utilized to reference out-of-classroom and in-classroom educational experiences via technology, even as advances continue in regard to devices and curriculum.

E-learning is the computer and network-enabled transfer of skills and knowledge. E-learning applications and processes include Web-based learning, computer-based learning, virtual education opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

Nowadays, it is commonly thought that new technologies can strongly help in education. In young ages especially, children can use the huge interactivity of new media, and develop their skills, knowledge, perception of the world, under their parents monitoring, of course. In no way traditional education can be replaced, but in this era of fast technological advance and minimization of distance through the use of the Internet, everyone must be equipped with basic knowledge in technology, as well as use it as a medium to reach a particular goal. Abbreviations like CBT (Computer-Based Training), IBT (Internet-Based Training) or WBT (Web-Based Training) have been used as synonyms to e-learning.
Global Classrooms

Global Classrooms is a U.S. based global education program, belonging to the United Nations Association of the United States of America (UNA-USA), that engages middle school and high school students in an exploration of current world issues through Model United Nations, wherein students step into shoes of UN Ambassadors and debate a range of issues on the UN agenda. Global Classrooms was created primarily for students in economically disadvantaged public schools who have little or no knowledge of global affairs or experience with Model UN.

The Global Classrooms program is currently in 24 major cities around the world. Global Classrooms bridges the gap in the Model UN community between established global education programs and traditionally underserved public schools by exposing students to the growing influence of globalization.

Background

Early in the 1990s UNA-USA observed that Model UN activities overwhelmingly attracted the participation of students and teachers from private and/or affluent suburban schools. Believing it to be of critical importance, UNA-USA determined that it would increase the number of students from economically disadvantaged public schools participating in Model UN. Global Classrooms was founded in 1999, as a vehicle for education to reach students who would otherwise never have the opportunity to participate in Model UN. It has been estimated that annually, over 300,000 high school and university students worldwide participate in Model United Nations activities.

Program Support

Numerous organizations and high profile individuals have supported the Global Classrooms program. On May 13, 2010, MTV Networks International President, MTV Staying Alive Chairman, and UNAIDS Ambassador Bill Roedy addressed the Global Classrooms international student delegation at the UN General Assembly, during which he discussed issues ranging from AIDS and HIV to global media.

Past Global Classrooms conferences have hosted speakers and guests such as: Secretary of State Hillary Clinton, Esther Brimmer, Assistant Secretary of State for International Organization Affairs, Ambassador Frederick "Rick" Barton, U.S. Permanent Representative to the United Nations Economic and Social Council, former Minister of Foreign Affairs of the Kingdom of Thailand, Kantathi Suphamongkhon and on multiple occasions, the United Nations Secretary-General Ban Ki-moon.
The United States Department of State is a major supporter of Global Classrooms and Model UN and annually offers its headquarters as the conference venue for the Global Classrooms DC conference. In addition to its ties to the diplomatic community, Global Classrooms continues to benefit from school based partnerships with school districts and universities such as: Chicago Public Schools Kyung Hee University, Lebanese American University, and the Mulberry School for Girls.

**EDUSAT and its Utilization**

Educational Technology (ET) is a systematic way of designing, implementing and evaluating the total process of learning and teaching in terms of specific objectives, based on research on human learning and communication and employing a combination of human and non-human resources to bring about more effective instruction (Commission of Instructional Technology, USA). Realising the importance of Media and Educational Technology in India, the National Policy on Education in its modified document-1992 (Media and Educational Technology, Para 8.10-11, Page 38) states that, "Modern communication technologies have the potential to bypass several stages and sequences in the process of development encountered in earlier decades. Both the constraints of time and distance at once become manageable. In order to avoid structural dualism, modern educational technology must reach out to the most distant areas and deprive sections of beneficiaries simultaneously with the area of comparative affluence and ready availability. Further it has stated that "Educational Technology will be employed in the spread of useful information, the training and retraining of teachers, to improve quality education, sharpen awareness of art and culture, inculcate abiding values etc., both in the formal and non-formal sectors. Maximum use will be made of the available infrastructure.

Today, our country engages nearly 55 lakhs teachers spread over around 10 lakhs schools to educate about 2,025 lakh children (Source: Chapter-I, NCF-2005, page 1). Also if we look at the data and analyse on the growth of teacher education organizations in the country, it reveals that the number of these institutions have been multiplied i.e. as on 31.03.2000 there were 2051 such organizations and as on 31.03.2005 the figure is 4550 (Source: NCTE-Annual Report, 2000 – 2001 and 2004- 2005). Orientation of teachers and teacher educators of such a huge system at regular intervals is always a challenging task. Covering all such teacher educators only through face-to-face training and orientation programmes is virtually impossible. Organization of orientation programmes through a cascade model i.e. multi-tier training strategy (training of Key - Resource Persons, Master Trainers etc. at State, District, Block and Cluster
level) may be one of the modalities for training and re-training of a large number of teachers and teacher educators of our country. Special Orientation of Primary School Teachers (SOPT) and Programme for Mass Orientation of School Teachers (PMOST) was organized through adopting such strategy. However, keeping in view the transmission loss through such programmes (training through cascade model) and the resource crunch with the states, training of teachers through distance mode (video and audio conferencing) could be a better option.

In the recent years Media and Educational Technology are being employed to revitalise the entire education system all over the world. With Launching of a series of satellites by Indian Space Research Organisation (ISRO) broadcasting (audio and video) and teleconferencing facilities are now available in almost every states and UTs of our country. The concept of beaming educational programmes through satellites was demonstrated for the first time in India through Satellite Instruction Television Experiment (SITE) in 1975-76 using American Application Technology Satellite (ATS-6). During this unique experiment, which is hailed as the largest sociological experiment conducted anywhere in the world programmes pertaining to health, hygiene and family planning were telecast directly to about 2400 Indian villages spread over six states. Later with commissioning of INSAT system in 1983 a variety of educational programmes is being telecast. In the 90s Jhabua Development Communication Project (JDPC) and Training Development Communication Channel (TDCC) further demonstrated the efficacy of tele-education. Even in the year 1996-97 under the tele-SOPT programme teachers of Madhya Pradesh and Karnataka were trained through video-conferencing. This has further established the importance of satellite communication in the field of education.

**Launching of EDUSAT:**

Keeping in view usefulness of the INSAT in educational programmes MHRD visualized EDUSAT project in October 2002. The satellite was launched on 20 September 2004. EDUSAT is the first Indian satellite built exclusively for serving the educational sector offering an interactive satellite based distance education system for the country. It is specially configured for the audiovisual medium, employing digital interactive classroom and multimedia multicentric systems. EDUSAT is primarily meant for providing connectivity to school, college and higher levels of education and also to support non-formal education including developmental communication. The scope of the EDUSAT programme is planned to be realised in three phases.

EDUSAT carries five Ku-band transponders providing spot beams, one Ku-band transponder providing a national beam and six Extended C-band transponders with national coverage beam. It will join the INSAT system that
already has more than 130 transponders in C-band, Extended C-band and Ku-band providing a variety of telecommunication and television services. The EDUSAT offers opportunities for using satellite for human development in general and for education in particular. EDUSAT can be used for:

- Conventional Radio and Television broadcasting
- Interactive Radio and Television (phone-in, video on demand...)
- Exchange of data
- Video conferencing, Audio conferencing & Computer conferencing
- Web based education

**Phases of EDUSAT operation:**

In the first phase of pilot projects, a Ku-band transponder on board INSAT-3R, which is already in orbit, is being used. In this phase, Visveswaraiah Technological University (VTU) in Karnataka, Y B Chavan State Open University in Maharashtra and the Rajiv Gandhi Technical University in Madhya Pradesh are covered. In the second phase, EDUSAT spacecraft will be used in a semi-operational mode with at least one uplink in each of the five spot beams. About 100-200 classrooms will be connected in each beam. Coverage will be extended to two more states and one national institution. In the third phase, EDUSAT network is expected to become fully operational ISRO will provide technical and managerial support in the replication of EDUSAT ground systems to manufacturers and service providers. Users are expected to provide funds for this. In this phase, ground infrastructure to meet the country's educational needs will be built and during this period, EDUSAT will be able to support about 25 to 30 uplinks and about 5000 remote terminals per uplink. Currently we are beginning the second phase. Typically, two kinds of connectivity have been proposed. Satellite Interactive Terminals (SIT) and Receive Only Terminals (ROT). The details are as follows:

- SIT with 1.2 meter antenna for low data rates (other equipment include a WLL connection a PC, a telephone and a television set) and is recommended for higher secondary schools and colleges. It can be used for TV broadcasting and data broadcasting.
- SIT for high data rates with an antenna of 1.8 meter. It is considered suitable for direct interactivity over satellite channel for higher rates and for video conferencing and is capable of receiving TV and data broadcasting. Professional and university network can use this SIT with telephone and a PC for two way video and two way audio facilities.
• 0.7 meter Ku-Band TV antennas known as Receive Only Terminals (ROT) (these shall comprise of antenna, TV set and a PC). It can be used for TV and data reception by the schools as and when required. Each of the National and Regional beams can be split into number of channels.

The EDUSAT is designed to support about 72 channels, which are proposed to be distributed as follows:

• State channels 56 (28 for higher education and 28 for school education)
• 14 National channels each for various sectors: higher education, school education, technical education, adult education etc.

EDUSAT network and CIET (NCERT)

Central Institute of Educational Technology (CIET), NCERT has been utilising satellite technologies for about three decades. It has gained a wide range of experience in design and organisation of programmes using such technologies. Some of these experiments is:

• Participation in Satellite Instructional Television Experiment (SITE) in 1975-76 in collaboration with ISRO
• Training of 48000 Science Teachers using multi-media programmes.
• Conduct of Classroom – 2000 Project in 1993 using technique of teleconference for direct teaching of Physics and Mathematics to the students at Senior Secondary level.
• Undertaking four experiments in the year 1996 and 1997 for the Orientation of Teachers under SOPT programme of MHRD and Hard Spots of Mathematics in the State of Karnataka and M.P.
• Telecast of video programmes on National Network of Doordarshan and the cable channel Gyan Darshan (February, 2000).

The EDUSAT configuration has allowed CIET, NCERT to develop a network of institutions; together constituting a national network. This network facilitates an on demand two-way communication between institutions and within the schools of each institution. The school sector is to get a National Channel along with necessary uplink and down links. CIET (NCERT) has taken an initiative in this regard and entered into a MoU (Memorandum of Understanding) with ISRO for this purpose. A Ku-Band Sub/Mini Hub has been installed at the CIET along with 100 terminals for installations at different locations in all the states and UTs. The proposed school network could be used by various agencies for undertaking training programmes directly with the target groups as against the current approach of training
master trainers, key resource persons and then reaching out to the target groups.

The various institutes of NCERT require distance mode of satellite education for conduct of training programmes, holding of virtual conferences, exchange of data and other services viz. linking of libraries and media resources of various Institutions.

**EDUSAT network and its Utilisation by CIET, NCERT**

By using this network NCERT, so far has organized the following programmes for teachers and teacher educators of our country:

- Orientation of Teachers of KVs/ JNVs/ CBSE affiliated schools on new textbooks developed in the light of National Curriculum Framework-2005
- Orientation of Principals and Head Teachers of KVs on NCF-05 and primary level textbooks brought out in the light of NCF-2005
- Orientation of Fine Arts and Music Teachers
- Orientation of Teacher Educators of SCERTs, DIETs, CTEs and IASEs on NCF-2005
- Orientation of Teachers on Gender issues in Education
- Orientation of Teachers and Teacher Educators on New Trends in Evaluation
- Strengthening Guidance and Counselling: Orientation of State Level Key Personnel through Video Conferencing

In all about 100 days video conferencing was planned and organized by NCERT through EDUSAT network covering thousands of teachers and teacher educators of the country.

**Conclusion:**

As India enters the new millennium, it is necessary to sustain such kind of effort by continuously tuning it to the fast changing requirement and updating the technology that goes into the making of these sophisticated systems. The challenges continue to grow but that is what attracts and sustains the interests of personnel working in the space programme. Even if a satellite is launched, its meaningful utilization in any sector including education is a million dollar question and raises many eyebrows. The life span of EDUSAT, which was launched in September, 2004 is seven years and it has provided many facilities and possibilities. But the real challenge before us is how to feed this monster and reach out the rural masses especially millions of student’s teachers and
teacher educators in the country. For the successful use of this satellite a rigorous planning is need of the hour and collaborative efforts are essential for designing of the software and its utilization for achieving goals of education.

**Access Digital Data (ADD)**

Access Digital Data (ADD), leader in analysis software, provides business intelligence (BI) software that helps leading organizations make better business decisions every day. It helps businesses make better decisions through better insight from their data. Access Digital Data’s web accessible SaaS platform offers an integrated solution to all business data query, reporting and advanced analytical needs, and distributes insight to users at their desks and on the go.

It is easily used by large and small organizations alike to achieve unlimited data analysis and data mining, build executive reports, predict business opportunities, improve operations management, and enable executive decision making throughout the enterprise.

**British Library**

The British Library is the national library of the United Kingdom, and is the world’s largest library in terms of total number of items. The library is a major research library, holding over 150 million items from many countries, in many languages and in many formats, both print and digital: books, manuscripts, journals, newspapers, magazines, sound and music recordings, videos, play-scripts, patents, databases, maps, stamps, prints, drawings. The Library's collections include around 14 million books (second only to the United States' Library of Congress), along with substantial holdings of manuscripts and historical items dating back as far as 2000 BC.

As a legal deposit library, the British Library receives copies of all books produced in the United Kingdom and the Republic of Ireland, including a significant proportion of overseas titles distributed in the UK. It also has a programme for content acquisitions. The British Library adds some three million items every year occupying 9.6 kilometres (6.0 mi) of new shelf space. The library is a non-departmental public body sponsored by the Department for Culture, Media and Sport. It is located on the north side of Euston Road in St Pancras, London (between Euston railway station and St Pancras railway station) and has a document storage centre and reading room at Boston Spa, Wetherby in West Yorkshire.

The library was originally a department of the British Museum and from the mid-19th century occupied the famous circular British Museum Reading Room. It became legally separate in 1973, and by 1997 had moved into its new purpose-built building at St Pancras, London.
Historical background

The British Library was created on 1 July 1973 as a result of the British Library Act 1972. Prior to this, the national library was part of the British Museum, which provided the bulk of the holdings of the new library, alongside smaller organisations which were folded in (such as the National Central Library, the National Lending Library for Science and Technology and the British National Bibliography). In 1974 functions previously exercised by the Office for Scientific and Technical Information were taken over; in 1982 the India Office Library and Records and the HMSO Binderies became British Library responsibilities. In 1983, the Library absorbed the National Sound Archive, which holds many sound and video recordings, with over a million discs and thousands of tapes.

The core of the Library’s historical collections is based on a series of donations and acquisitions from the 18th century, known as the ‘foundation collections’. These include the books and manuscripts of Sir Robert Cotton, Sir Hans Sloane, Robert Harley and the King’s Library of King George III, as well as the Old Royal Library donated by King George II.

For many years its collections were dispersed in various buildings around central London, in places such as Bloomsbury (within the British Museum), Chancery Lane, and Holborn, with an interlibrary lending centre at Boston Spa, Wetherby in West Yorkshire (situated on Thorp Arch Trading Estate) and the newspaper library at Colindale, north-west London. Since 1997 the main collection has been housed in a single new building on Euston Road next to St Pancras railway station, although post-1800 newspapers are still held at Colindale, and the Document Supply Centre is in Yorkshire. The Library previously had a book storage depot in Woolwich, south-east London, which is no longer in use. The new library was designed specially for the purpose by the architect Colin St John Wilson. Facing Euston Road is a large piazza that includes pieces of public art, such as large sculptures by Eduardo Paolozzi (a bronze statue based on William Blake’s study of Isaac Newton) and Antony Gormley. It is the largest public building constructed in the United Kingdom in the 20th century.

In the middle of the building is a four-storey glass tower containing the King’s Library, with 65,000 printed volumes along with other pamphlets, manuscripts and maps collected by King George III between 1763 and 1820. In December 2009 a new storage building at Thorp Arch, City of Leeds, West Yorkshire was opened by Rosie Winterton. The new facility, costing £26 million, has a capacity for seven million items, stored in more than 140,000 bar-coded containers, which are retrieved by robots, from the 162.7 Miles of temperature and humidity-controlled storage space.
Legal deposit

In England, legal deposit can be traced back to at least 1610. An Act of Parliament in 1911 established the principle of the legal deposit, ensuring that the British Library and five other libraries in Great Britain and Ireland are entitled to receive a free copy of every item published or distributed in Britain. The other five libraries are: the Bodleian Library at Oxford; the University Library at Cambridge; the Trinity College Library at Dublin; and the National Libraries of Scotland and Wales. The British Library is the only one that must automatically receive a copy of every item published in Britain; the others are entitled to these items, but must specifically request them from the publisher after learning that they have been or are about to be published, a task done centrally by the Agency for the Legal Deposit Libraries.

Further, under the terms of Irish copyright law (most recently the Copyright and Related Rights Act 2000), the British Library is entitled to automatically receive a free copy of every book published in the Republic of Ireland, alongside the National Library of Ireland, the Trinity College Library at Dublin, the library of the University of Limerick, the library of Dublin City University and the libraries of the four constituent universities of the National University of Ireland. The Bodleian Library, Cambridge University Library, and the National Libraries of Scotland and Wales are also entitled to copies of material published in Ireland, but again must formally make requests.

In 2003 the Ipswich MP Chris Mole introduced a Private Member’s Bill which became the Legal Deposit Libraries Act 2003. The Act extends United Kingdom legal deposit requirements to electronic documents, such as CD-ROMs and selected websites. The Library also holds the Asia, Pacific and Africa Collections (APAC) which include the India Office Records and materials in the languages of Asia and of north and north-east Africa.

Using the library's reading rooms

The mechanical book handling system (MBHS) used to deliver requested books from stores to reading rooms. Bill Woodrow's 'Sitting on History' was purchased for the British Library by Carl Djerassi and Diane Middlebrook in 1997. Sitting on History, with its ball and chain, refers to the book as the captor of information which we cannot escape. The bust visible top left is Colin St.John Wilson RA by Celia Scott, 1998 a gift from the American Trust for the British Library. Sir Colin designed the British Library building. The Library is open to everyone who has a genuine need to use its collections. Anyone with a permanent address who wishes to carry out research can apply for a Reader
Pass; they are required to provide proof of signature and address for security purposes.

Historically, only those wishing to use specialised material unavailable in other public or academic libraries would be given a Reader Pass. Recently, the Library has been criticised for admitting numbers of undergraduate students, who have access to their own university libraries, to the reading rooms. The Library replied that it has always admitted undergraduates as long as they have a legitimate personal, work-related or academic research purpose. The majority of catalogue entries can be found on Explore the British Library, the Library's main catalogue, which is based on Primo. Other collections have their own catalogues, such as western manuscripts. The large reading rooms offer hundreds of seats which are often filled with researchers, especially during the Easter and summer holidays.

Material available online

The British Library makes a number of images of items within its collections available online. Its Online Gallery gives access to 30,000 images from various medieval books, together with a handful of exhibition-style items in a proprietary format, such as the Lindisfarne Gospels. This includes the facility to "turn the virtual pages" of a few documents, such as Leonardo da Vinci's notebooks. Catalogue entries for a large number of the illuminated manuscript collections are available online, with selected images of pages or miniatures from a growing number of them, and there is a database of significant bookbindings.

The British Library's commercial secure electronic delivery service was started in 2003 at a cost of £6 million. This offers more than 100 million items (including 280,000 journal titles, 50 million patents, 5 million reports, 476,000 US dissertations and 433,000 conference proceedings) for researchers and library patrons worldwide which were previously unavailable outside the Library due to copyright restrictions. In line with a government directive that the British Library must cover a percentage of its operating costs, a fee is charged to the user. However, this service is no longer profitable and has led to a series of restructures to try to prevent further losses. When Google Books started, the British Library signed an agreement with Microsoft to digitise a number of books from the British Library for its Live Search Books project. This material was only available to readers in the US, and closed in May 2008. The scanned books are currently available via the British Library catalogue or Amazon.

In October 2010 the British Library launched its Management and business studies portal. This website is designed to allow digital access to management research reports, consulting reports, working papers and articles. In November
2011, four million newspaper pages from the 18th and 19th centuries were made available online. The project will scan up to 40 million pages over the next 10 years. The archive is free to search, but there is a charge for accessing the pages themselves.

**Exhibitions**

A number of books and manuscripts are on display to the general public in the Sir John Ritblat Gallery which is open seven days a week at no charge. Some of the manuscripts in the exhibition include Beowulf, the Lindisfarne Gospels and St Cuthbert Gospel, a Gutenberg Bible, Geoffrey Chaucer’s Canterbury Tales, Thomas Malory’s Le Morte d’Arthur (King Arthur), Captain Cook’s journal, Jane Austen’s History of England, Charlotte Brontë’s Jane Eyre, Lewis Carroll’s Alice’s Adventures Under Ground, Rudyard Kipling’s Just So Stories, Charles Dickens’s Nicholas Nickleby, Virginia Woolf’s Mrs Dalloway and a room devoted solely to Magna Carta, as well as several Qu’rans and Asian items. In addition to the permanent exhibition, there are frequent thematic exhibitions which have covered maps, sacred texts and the history of the English language.

**Business and IP Centre**

In May 2005, the British Library received a grant of £1 million from the London Development Agency to change two of its reading rooms into the Business & IP Centre. The Centre were opened in March 2006. It holds arguably the most comprehensive collection of business and intellectual property (IP) material in the United Kingdom and is the official library of the UK Intellectual Property Office. The collection is divided up into four main information areas: market research, company information, trade directories, and journals. It is free of charge in hard copy and online via approximately 30 subscription databases. Registered readers can access the collection and the databases.

There are over 50 million patent specifications from 40 countries in a collection dating back to 1855. The collection also includes official gazettes on patents, trade marks and Registered Design; law reports and other material on litigation; and information on copyright. This is available in hard copy and via online databases. Staffs is trained to guide small and medium enterprises (SME) and entrepreneurs to use the full range of resources.

**Sound archive**

The British Library Sound Archive holds more than a million discs and 185,000 tapes. The collections come from all over the world and cover the entire range of recorded sound from music, drama and literature to oral history and wildlife sounds, stretching back over more than 100 years. The Sound Archive’s online catalogue is updated daily. It is also possible to listen to recordings from
the collection in selected Reading Rooms in the Library through their Sound Server and Listening and Viewing Service, which is based in the Rare Books & Music Reading Room. In 2006 the Library launched a new online resource Archival Sound Recordings which makes over 10,000 hours of the Sound Archive’s recordings available online for UK higher and further education and the general public.

**Newspapers**

The British Library Newspapers section is based in Colindale in North London. The Library has an almost complete collection of British and Irish newspapers since 1840. This is partly because of the legal deposit legislation of 1869, which required newspapers to supply a copy of each edition of a newspaper to the library. London editions of national daily and Sunday newspapers are complete back to 1801. In total the collection consists of 660,000 bound volumes and 370,000 reels of microfilm containing tens of millions of newspapers with 52,000 titles on 45 km of shelves. In May 2010 a ten year programme of digitisation of the newspaper archives with commercial partner DC Thomson subsidiary brightsolid began. In November 2011, BBC News announced the launch of the British Newspaper Archive, an initiative to facilitate online access to over one million pages of pre-20th century newspapers.

Among the collections are the Thomason Tracts, containing 7,200 17th century newspapers, and the Burney Collection, featuring newspapers from the late 18TH century and early 19TH century. The Thomason Tracts and Burney collections are held at St Pancras, and are available in digital facsimile. The section also has extensive records of non-British newspapers in languages that use the Latin and Cyrillic alphabets. The Library's substantial holdings of newspapers in the languages of Asia and the Middle East may be accessed at the Library’s reading rooms at St. Pancras.

**Philatelic Collections**

The British Library Philatelic Collections are held at St Pancras. The Collections were established in 1891 with the donation of the Tapling collection, they steadily developed and now comprise over 25 major collections and a number of smaller ones, encompassing a wide-range of disciplines. The collections include postage and revenue stamps, postal stationery, essays, proofs, covers and entries, "cinderella stamp" material, specimen issues, airmails, some postal history materials, official and private posts, etc., for almost all countries and periods.

An extensive display of material from the collections is on exhibit, which may be the best permanent display of diverse classic stamps and philatelic
material in the world. Approximately 80,000 items on 6,000 sheets may be viewed in 1,000 display frames; 2,400 sheets are from the Tapling Collection. All other material, which covers the whole world, is available to students and researchers. As well as these collections, the library actively acquires literature on the subject. This makes the British Library one of the world’s prime philatelic research centres. The Head Curator of the Philatelic Collections is David Beech.

Questions

1. Write a note on Spread sheets.
2. ‘PowerPoint is a presentation graphics software tool’. Explain.
3. What is DTP?
4. Write an essay on the concepts of worldwide class rooms.
5. Examine the important characteristics of Edusat Satellite
UNIT-IV

CONTRIBUTION TO RESEARCH IN HISTORY AND IMPORTANT SITES TO ACCESS

Quantification and Data Analysis

Quantitative investigation began when people started counting. Quantitative methods is largely used by the researchers of social sciences such as anthropology, sociology and political science. It involves statistical sampling, classification, measurement and analysis of numerical data. Quantification methods have been effectively aided and adapted by IT since they use mathematical models, theories and hypotheses. Statistics is the backbone of quantitative research. One of the main areas of social sciences research where the advantages of IT are largely used in the field of Survey Research. Under Survey research the scholar takes up the study of a particular situation or to build a database pertaining to it. Conventionally such surveys were conducted through printed questionnaires or telephonic surveys. This costly and time consuming, but popular method of social science is now made easy by internet and email communications.

Collection of data on the basis of hypothesis is the starting point for applying quantification method in social sciences. This sample data is subjected to verification and validation before different levels of analyses are conducted. Both empirical observations and statistical tools are used to discover the causal relations of social processes. Data processing is an important segment of social sciences research. It was for this job that social science researcher’s strated using computers on a large scale. Computer enables quick and easy organization and analysis of data by using program packages. There are two types of data processing. The first one, known as database processing is a collection of common records that can be searched, accessed, and modified. The second, known as transaction processing involves two computers - one prompting a transaction and the other making the necessary computations. It should be remembered that data processing has been one of the major driving forces behind the development of personal computers.

Problems related to the overwhelming census data Herman Hollerith’s innovation of card tabulation. He founded the Tabulating Machine Company in
1896 which later became the popular IBM (International Business Machines Corporation. A variety of machines were developed during the WWII. It was with the introduction of the first all-electronic computer called ENIAC in 1946 that electronic supported data processing was begun. The first non-military electronic programmable computer, UNIVAC, for data processing was introduced in 1950

A distinction between business data processing and scientific data processing was emerged. Hardware changes also influenced the development of many programming languages. The COBOL (COmmon Business Oriented Language) and FORTRAN (FORmula TRANslatation) became popular tools of tabulation. Efficient programs such as C were introduced during the 1970s and other languages were developed with the extension of C++ing the 1980s. Many more sophisticated but highly flexible applications were started appearing.

**Statistical Package for the Social Sciences (SPSS)**

**Introduction**

The SPSS is a computer application that provides statistical analysis of data. It allows for in-depth data access and preparation, analytical reporting, graphics and modelling. SPSS (originally, Statistical Package for the Social Sciences) is a software program developed in the late 1960s by graduate students at Stanford University. Although initially created to manage a large survey research project of citizen participation in seven nations, the package quickly gained popularity, and was greatly enhanced over the next few years. In 1985, a micro-computer version of SPSS for IBM-compatible personal computers was introduced, which included many of the most popular features of the mainframe version of SPSS. Today there are more than one million users of SPSS in academic, business, government, and non-profit organizations.

**Concept of Statistical Package for the Social Sciences**

SPSS is the data analysis package of choice for people wanting to analyze quantitative data. However, most researchers find dealing with quantitative data quite daunting. Although most researchers are quite comfortable with qualitative research methods and analyses, they tend to shy away from using quantitative statistics. However, the ability to perform quantitative data analysis is increasingly becoming an important skill for researchers to possess. Actually most people’s fear of statistics is unfounded. The advent of computer software programmes such as SPSS that can be used to analyze data, has meant that people do not have to know or learn mathematical formulae in order to be able to perform quantitative statistical analyses. Nowadays, all one needs to know is the appropriate analyses to perform on their data and how to do it so they can obtain the information they need to know.
Knowledge of SPSS is useful because:

- SPSS is a leader in the field of market research and social surveys
- It has been in the forefront of these fields for over 40 years
- It is a very powerful piece of software that will enable you to carry out quantitative analysis in seconds
- You can legitimately see it as an extension or complement to Excel
- It is easier to use than other packages when it comes to handling large datasets
- It may help you get a job in the job market.

**Statistical Package for the Social Sciences for Windows**

SPSS for Windows is a comprehensive, interactive, general-purpose package for data analysis and it includes most routine statistical techniques. SPSS is a true Windows package being mouse-driven with movable, scalable windows, drop-down menus and dialog boxes. Underlying the graphical interface is a command language consistent with previous versions of the package.

SPSS for Windows is probably one of the easiest major statistics package to use. It allows even inexperienced users to run complicated statistical analyses at the click of a few buttons. When you are at the PC, you are in charge of the package and it will attempt to do whatever you ask it, whether your instructions are sensible or not. The adage of garbage in, garbage out applies. It is therefore essential that you get a good understanding of the commands that you need to use and what the results mean.

SPSS for Windows provides a powerful statistical analysis and data management system in a graphical environment, using descriptive menus and simple dialog boxes to do most of the tasks for you. Simply pointing and clicking the mouse can accomplish most tasks.

SPSS provides a powerful statistical-analysis and data-management system in a graphical environment, using descriptive menus and simple dialog boxes to do most of the work for you.

In addition to the simple point-and-click interface for statistical analysis, SPSS provides:

**Data editor:** The Data Editor is a versatile spreadsheet-like system for defining, entering, editing, and displaying data.
**Viewer:** The Viewer makes it easy to browse your results, selectively show and hide output, change the display order results, and move presentation-quality tables and charts to and from other applications.

**Multidimensional pivot tables:** Your results come alive with multidimensional pivot tables. Explore your tables by rearranging rows, columns, and layers. Uncover important findings that can get lost in standard reports. Compare groups easily by splitting your table so that only one group is displayed at a time.

**High-resolution graphics:** High-resolution, full-color pie charts, bar charts, histograms, scatter-plots, 3-D graphics, and more are included as standard features.

**Database access:** Retrieve information from databases by using the Database Wizard instead of complicated SQL queries.

**Data transformations:** Transformation features help get your data ready for analysis. You can easily subset data; combine categories; add, aggregate, merge, split, and transpose files; and more.

**Online help:** Detailed tutorials provide a comprehensive overview; context-sensitive Help topics in dialog boxes guide you through specific tasks; pop-up definitions in pivot table results explain statistical terms; the Statistics Coach helps you find the procedures that you need; Case Studies provide hands-on examples of how to use statistical procedures and interpret the results.

**Command language:** Although most tasks can be accomplished with simple point-and-click gestures, SPSS also provides a powerful command language that allows you to save and automate many common tasks. The command language also provides some functionality that is not found in the menus and dialog boxes.

**New added to Statistical Package for the Social Sciences 16.0**

**User Interface Enhancements:** Enhancements to the point-and-click interface include:

- All dialog boxes are now resizable. The ability to make a dialog box wider makes variable lists wider so that you can see more of the variable names and/or descriptive labels. The ability to make a dialog box longer makes variable lists longer so that you can see more variables without scrolling.
- Drag-and-drop variable selection is now supported in all dialog boxes.
• Variable list display order and display characteristics can be changed on the fly in all dialog boxes. Change the sort order (alphabetic, file order, measurement level) and/or switch between display of variable names or variable labels whenever you want.

**Data and Output Management:** Data and output management enhancements include:

- Read and write Excel 2007 files.
- Choose between working with multiple datasets or one dataset at a time.
- Search and replace information in Viewer documents, including hidden items and layers in multidimensional pivot tables.
- Assign missing values and value labels to any string variable, regardless of the defined string width (previously limited to strings with a defined width of 8 or less bytes).
- New character-based string functions.
- Output Management System (OMS) support for Viewer file format (.spv) and VML-format charts and image maps with pop-up chart information for HTML documents.
- Customize Variable View in the Data Editor. Change the display order of the attribute columns, and control which attribute columns are displayed.
- Sort variables in the active dataset alphabetically or by attribute (dictionary) values.
- Spell check variable labels and value labels in Variable View.
- Change basic variable type (string, numeric), change the defined width of string variables, and automatically set the width of string variables to the longest observed value for each variable.
- Read and write Unicode data and syntax files.
- Control the default directory location to look for and save files.

**Performance:** For computers with multiple processors or processors with multiple cores, multithreading for faster performance are now available for some procedures.

**Statistical Enhancements:** Statistical enhancements include:

- **Partial Least Squares (PLS):** A predictive technique that is an alternative to ordinary least squares (OLS) regression, canonical correlation, or structural
equation modeling, and it is particularly useful when predictor variables are highly correlated or when the number of predictors exceeds the number of cases.

· **Multilayer Perceptron (MLP):** The MLP procedure fits a particular kind of neural network called a multilayer perceptron. The multilayer perceptron uses feed-forward architecture and can have multiple hidden layers. The multilayer perceptron is very flexible in the types of models it can fit. It is one of the most commonly used neural network architectures. This procedure is available in the new Neural Networks option.

· **Radial Basis Function (RBF):** A Radial basis function (RBF) network is a feed-forward, supervised learning network with only one hidden layer, called the radial basis function layer. Like the multilayer perceptron (MLP) network, the RBF network can do both prediction and classification. It can be much faster than MLP; however it is not as flexible in the types of models it can fit. This procedure is available in the new Neural Networks option.

· Generalized Linear Models supports numerous new features, including ordinal multinomial and Tweedie distributions, maximum likelihood estimation of the negative binomial ancillary parameter, and likelihood-ratio statistics. This procedure is available in the Advanced Models option.

· Cox Regression now provides the ability to export model information to an XML (PMML) file. This procedure is available in the Advanced Models option.

· **Complex Samples Cox Regression:** Apply Cox proportional hazards regression to analysis of survival times – that is, the length of time before the occurrence of an event for samples drawn by complex sampling methods. This procedure supports continuous and categorical predictors, which can be time-dependent. This procedure provides an easy way of considering differences in subgroups as well as analyzing effects of a set of predictors. The procedure estimates variances by taking into account the sample design used to select the sample, including equal probability and Probability Proportional to Size (PPS) methods and With Replacement (WR) and Without Replacement (WOR) sampling procedures. This procedure is available in the Complex Samples option.

**Statistical Package for the Social Sciences Products**

SPSS is used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations and others. In addition to statistical analysis, data management (case selection, file reshaping, creating derived data) and data documentation (a metadata dictionary is stored with the data) are features of the base software.
The developers of the Statistical Package for the Social Sciences (SPSS) made every effort to make the software easy to use. This prevents you from making mistakes or even forgetting something. That’s not to say it’s impossible to do something wrong, but the SPSS software works hard to keep you from running into the ditch. To foul things up, you almost have to work at figuring out a way of doing something wrong.

You always begin by defining a set of variables, and then you enter data for the variables to create a number of cases. For example, if you are doing an analysis of automobiles, each car in your study would be a case. The variables that define the cases could be things such as the year of manufacture, horsepower, and cubic inches of displacement. Each car in the study is defined as a single case, and each case is defined as a set of values assigned to the collection of variables. Every case has a value for each variable. (Well, you can have a missing value, but that’s a special situation described later.)

Variables have types. That is, each variable is defined as containing a specific kind of number. For example, a scale variable is a numeric measurement, such as weight or miles per gallon. A categorical variable contains values that define a category; for example, a variable named gender could be a categorical variable defined to contain only values 1 for female and 2 for male. Things that make sense for one type of variable don’t necessarily make sense for another. For example, it makes sense to calculate the average miles per gallon, but not the average gender.

After your data is entered into SPSS – your cases are all defined by values stored in the variables – you can run an analysis. You have already finished the hard part. Running an analysis on the data is much easier than entering the data. To run an analysis, you select the one you want to run from the menu, select appropriate variables, and click the OK button. SPSS reads through all your cases, performs the analysis, and presents you with the output.

You can instruct SPSS to draw graphs and charts the same way you instruct it to do an analysis. You select the desired graph from the menu, assign variables to it, and click OK.

When preparing SPSS to run an analysis or draw a graph, the OK button is unavailable until you have made all the choices necessary to produce output. Not only does SPSS require that you select a sufficient number of variables to produce output, it also requires that you choose the right kinds of variables. If a categorical variable is required for a certain slot, SPSS will not allow you to choose any other kind. Whether the output makes sense is up to you and your
data, but SPSS makes certain that the choices you make can be used to produce some kind of result.

All output from SPSS goes to the same place – a dialog box named SPSS Viewer. It opens to display the results of whatever you’ve done. After you have output, if you perform some action that produces more output, the new output is displayed in the same dialog box. And almost anything you do produce output.

**Loading/Using of Statistical Package for the Social Sciences**

Click on the SPSS option to load and run SPSS. You may get a screen that looks like this:

If you do, click on the cancel button at the bottom of the dialogue box to remove it. You will see Untitled SPSS Data Editor screen.

When you load and run the SPSS package it opens up a menu bar and two views. These are the Data View (currently visible) and the Variable View.

- **Menu Bar:** This provides a selection of options (File Edit View Data.....) which allow you for example to open files, edit data, generate graphs, create
tables and perform statistical analyses. Selecting from this menu bar will, like in other windows packages, provide further pull-down menus and dialogue boxes.

· **Data View:** This sheet contains your data (once you have entered it!), each column representing a variable for which data are available and each row representing that data for an individual or case. At present this sheet should be blank. As this sheet is currently selected its name on the tab at the bottom is in bold.

· **Variable View:** At present this sheet is not visible as the variable view sheet is not active. Consequently the name is not in bold.

The menu bar options are used as follows:

· **File** is used to access any files whether you want to Open an existing SPSS file or read data in from another application such as Excel of dBase, or start a new file. It is also the menu option you choose to save files.

· **Edit** can be used to alter data or text in the Data View or the Variable View.

· **View** can be used to alter the way your screen looks. Please leave this on the default settings.

· **Data** is used to define variables and make changes to the data file you are using.
· **Transform** is used to make changes to selected variable(s) in the data file you are using. This can include recode(ing) existing variables and compute(ing) new variables.

· **Analyze** is used to undertake a variety of analyses such as producing Reports, Calculating Descriptive Statistics such as Frequencies and Crosstabs (crosstabulations) and associated summary statistics, as well as various statistical procedures such as Regression and Correlation.

· **Graph** is used to create a variety of graphs and charts such as Bar, Line and Pie charts.

· **Utilities** are for more general housekeeping such as changing display options and fonts, displaying information on variables.

· **Window** operates in the same way as other Windows packages.

· **Help** is a context sensitive help feature which operates the same way as other Windows packages.

Enter the data in the SPSS data editor after creating variables. Then save the files as TEACH which will be saved as TEACH.SAV

You will now see the file appear in the Data View and the filename above the menu bar change to TEACH.SAV

**Example 1:** To check how variables have been coded

To check what the column heading for each variable and the codes refer to:

Click on the **Variable View** sheet at the bottom of the screen. You will now see:
The first column contains the variable **Name**, in the case of the first row “gender”. This is the column heading that appears in the Data View.

The second column refers to the **Type** of data. Although gender is categorical data, it is refereed to as numeric because numeric code values have been used. The key to these code values is given in the column headed **Values**.

The fifth column contains the variable’s **Label**. At present this is partially obscured by the subsequent column. To see the full value label:

(a) Move your mouse pointer in-between the Label and the Values column headings so that the appears.

(b) Click and drag the column width to the right until the variable’s label can be read.

(Note: if you wish to edit a variable’s label just retype the label in the appropriate cell)

The sixth column contains the key to the codes used for each variable. These are known as the **Values** Labels.

To see the Value Labels used:

(a) Click on the cell containing the first value for the variable gender

(b) Click on the to the right of this cell

The following dialogue box will be displayed:

It shows the current value labels for this variable.

**Note:** you can also use this option to change each value label for the codes or enter new value labels.
**Example 2:** Frequency distribution

Return to the Data View

Click on **Analyse** then **Descriptive Statistics** then **Frequencies**

This will usually give the **Frequencies** dialogue box. However sometimes the variables in the left hand box are arranged alphabetically.

If the variables are arranged alphabetically use the downward arrow on the left hand box to scroll down until **gender** appears.

Highlight **gender** in the left hand box by clicking on it. Click on the button to move gender into the **Variable(s)** box and then click on **OK**

You will now see a series of tables displayed in the SPSS **Output Viewer**. Note how SPSS first tells you if there are any missing cases. For this variable there is one missing case.
To save the contents of the SPSS Output Viewer to a file

(a) Ensure that the SPSS *Output Viewer* window is maximised

(b) Click on **File, Save as**

(c) Type in the filename you wish to save it to in the **File name** box, making sure the file type is *.spo*

(d) Ensure that the file is being saved to the correct drive and directory (N.B. please don’t save output from the *teach.sav* file)

(e) Click on the Save button

**Example 3:** To produce a bar chart

(a) Click on **Analyze, Descriptive Statistics, Frequencies**

(b) Deselect all variables by clicking on the **Reset** button

(c) Scroll down and select the variable **social class** in the normal way

(d) Click on the charts button, you will see the following dialogue box:

![Frequencies: Charts](image)

(e) Click on the **Bar Chart(s)** radio button and then on the **Continue** button

(f) At the **Frequencies** dialogue box click on **OK**

The SPSS Output Viewer should now contain your bar chart.

Notice that missing data are automatically excluded from the chart. Notice also that you are presented with a different menu bar which allows you to **Edit** the current chart and other options such as **Delete**.
Summary

Statistical software systems have been available for performing basic statistical analysis since the early years of the computer. These systems analyze large volumes of data and compute basic statistics such as means and standard deviations. They also compare sets of numbers and use such tests as t-tests and chi-square tests to determine how similar or different the number sets are. More sophisticated routines like multiple regression and analysis of variance are also included.

While a variety of statistical software systems exist, SAS and SPSS-X are the most robust packages for the MDSS. Due to the vast knowledge of mathematical and statistical background needed to use these systems, however, they are usually the favorite choice for the research analyst, not the manager. Therefore, managerial function software systems are also incorporated into the MDSS.

The SPSS, Inc. software package is designed to be user-friendly, even for novice computer users. Released in the Microsoft Windows format and touted as “Real Stats. Real Easy,” SPSS delivers easy data access and management, highly customizable output, complete just-in-time-training, and a revolutionary system for working with charts and graphs. The producers of SPSS proudly claim that “you don’t have to be a statistician to use SPSS,” an important characteristic for individuals who are somewhat afraid of computers and their power. Available in almost any format, SPSS provides immense statistical analysis capability while remaining one of the most user-friendly statistical packages available today.
Glossary

**Data Editor:** The data editor window is the default window when you run SPSS. The data worksheet works just like a spreadsheet, where a column represents a variable and a row represents a case or an observation.

**Data Transformation:** converts data from a source data format into destination data. It can be divided into two steps, namely data mapping which maps data elements from the source to the destination and captures any transformation that must occur and code generation that creates the actual transformation program.

**HTML:** stands for Hyper Text Markup Language. It is not a programming language, but a markup language (a set of markup tags).

**Object Linking and Embedding, Database (OLEDB):** An application programming interface designed by Microsoft for accessing data from a variety of sources in a uniform manner.

**SCILAB**

Scilab is an open source, cross-platform numerical computational package and a high-level, numerically oriented programming language. It can be used for signal processing, statistical analysis, image enhancement, fluid dynamics simulations, numerical optimization, and modeling and simulation of explicit and implicit dynamical systems. MATLAB code, which is similar in syntax, can be converted to Scilab. Scilab is one of several open source alternatives to MATLAB.

Scilab is a high-level, numerically oriented programming language. The language provides an interpreted programming environment, with matrices as the main data type. By utilizing matrix-based computation, dynamic typing, and automatic memory management, many numerical problems may be expressed in a reduced number of code lines, as compared to similar solutions using traditional languages, such as Fortran, C, or C++. This allows users to rapidly construct models for a range of mathematical problems. While the language provides simple matrix operations such as multiplication, the Scilab package also provides a library of high-level operations such as correlation and complex multidimensional arithmetic. The software can be used for signal processing, statistical analysis, image enhancement, fluid dynamics simulations, and numerical optimization.

Scilab also includes a free package called Xcos (based on Scicos) for modeling and simulation of explicit and implicit dynamical systems, including both continuous and discrete sub-systems. Xcos can be compared to Simulink.
from the MathWorks. As the syntax of Scilab is similar to MATLAB, Scilab includes a source code translator for assisting the conversion of code from MATLAB to Scilab. Scilab is available free of cost under an open source license. Due to the open source nature of the software, some user contributions have been integrated into the main program.

**License**

Scilab family 5 is distributed under the GPL-compatible CeCILL license. Prior to version 5, Scilab was semi-free software according to the nomenclature of the Free Software Foundation. The reason for this is that earlier versions’ licenses prohibited commercial distribution of modified versions of Scilab.

**Syntax**

Scilab syntax is largely based on the MATLAB language. The simplest way to execute Scilab code is to type it in at the prompt, -->, in the graphical command window. In this way, Scilab can be used as an interactive mathematical shell.

**LaTeX engine**

Scilab can render formulas in mathematical notation using its own Java-based rendering engine, a fork of the JMathTeX project.

**Toolboxes**

Scilab has many contributed toolboxes for different tasks:

- Scilab Image Processing Toolbox (SIP) and its variants (such as SIVP)
- Scilab Wavelet Toolbox
- Scilab Java and .NET Module
- Scilab Remote Access Module
- Scilab MySQL
- Equalis Communication Systems Module
- Equalis Signal Processing Module
- SoftCruncher Performance Accelerator

Many more toolboxes are available on ATOMS Portal or the Scilab forge.

Scilab was created in 1990 by researchers from INRIA and École nationale des ponts et chaussées (ENPC). The Scilab Consortium was formed in May 2003 to broaden contributions and promote Scilab as worldwide reference software in academia and industry. In July 2008, in order to improve the technology transfer, the Scilab Consortium joined the Digiteo Foundation.
"Scilab 5.1 alpha", the first release compiled for Mac, was available in early 2009, and supported Mac OS X 10.5, a.k.a. Leopard. Thus, OSX 10.4, Tiger, was never supported except by porting from sources. Linux and Windows builds had been released since the beginning, with Solaris support dropping off with version 3.1.1, and HP-UX dropping off with version 4.1.2 after spotty support.

In June 2010, the Consortium announced the creation of Scilab Enterprises. Scilab Enterprises develops and markets, directly or through an international network of affiliated services providers, a comprehensive set of services for Scilab users. Scilab Enterprises also develops and maintains the Scilab software. The ultimate goal of Scilab Enterprises is to help make the use of Scilab more effective and easy. In September 2010, Scilab Enterprises announced a world-wide partnership with Equalis to provide Scilab Online Support (SOS) Services. Through this partnership Scilab users can get the benefit of industrial-grade software, support, and services from Equalis and its network of partners anywhere in the world.

**Digital documentation**

Digital documentation is a method by which a company can convert paper documents into digital format. An electronic image of the original paper document is created which can be viewed on a computer. There are many benefits of converting paper into digital format and that is why it has been seen that more and more companies are converting their files, manuals, catalogues, brochures - in short all data which is on paper into a digital image.

If digital archiving of engineering or large format records is imperative to the continued success of your business, put your trust in Minfo's digital document archiving solutions. Create an effective integrated document archiving management system with printers and scanners. Digital archiving of critical engineering records becomes automatic with features like the scan-to-file option in monochrome and color scanners. And digital archiving of large format hardcopy such as banners and posters has never been easier.

Minfo's Image Logic technology takes document management a step further by producing optimal images from old and low contrast microfilm. The software manages and converts electronic records to industry standard TIFF or PDF files. Minfo enables people to share information by offering products and services for the reproduction, presentation, distribution and management of electronic paperwork.

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important planning chart, or look at candid photos of participants-all within an
easy-to-access Web page. A record of your agendas, text documents, and
reference documents in both text and PDF formats can be featured on the page.

If you'd like to look at the PowerPoint presentation that so vividly
illustrated the major points of your long-range planning, it, too, can be included
on the page. Digital documentation does it all-records your actions, reminds you
of the atmosphere of the event, and puts a face on key moments. No more need
to search through pages of minutes or boxes of photos.

**Reading Epigraph using Information Technology**

Even though computers are basically counting devices they can also
perform a number of sophisticated operations. Today the computer is used as a
powerful tool not only by scientists and engineers but also by social scientists
and archaeologists. During the recent past; scholars have made use of the
computer in the area of epigraphy in India and abroad. First the computer has
been used in studying the Indus script using techniques that are basically
statistical in nature. Secondly, the computer has been used in photo-composing.
Thirdly; it has been used for dating medieval Tamil inscriptions using numerical
methods. Fourthly, the computer has been used for image enhancement, fifthly,
it has been used for recognizing letters of the Brahmi script from AsoKan
inscriptions and the work is still in progress.

**Indus script**

Writing is an epitome of the intellectual creation of a civilisation. It
involves comprehension as well as abstraction of symbols that signify specific
achievement of human creativity and communication. Renfrew points out that
"The practice of writing, and the development of a coherent system of signs, a
script, is something which is seen only in complex societies... Writing, in other
words, is a feature of civilisations". When a civilisation leaves behind some
written records, they are invaluable not only to understand their civic society but
also to understand the basic thinking processes that moulded the civilisation.

Decipherment of any script is a challenging task. At times it is aided by the
discovery of a multilingual text where the same text is written in an undeciphered
script as well as known script(s). Both Egyptian hieroglyphs and Mesopotamian
cuneiform texts were deciphered with the help of multilingual texts. In some
cases, continuing linguistic traditions provide significant clues and at times
interlocking phonetic values are used as a proof of decipherment. In the absence
of these, statistical studies can provide important insights into the structure of
the script and can be used to define a syntactic framework for the script.
Indus script is a product of one of the largest Bronze Age civilisations often referred to as the Harappan civilisation. At its peak from 2500 BC to 1900 BC, the civilisation was spread over an area of more than a million square kilometres across most of the present day Pakistan, Afghanistan and north-western India. It was distinguished for its highly utilitarian and standardised life style, excellent water management system and architecture. The civilisation had flourishing trade links with West Asia and artefacts of the Harappan civilisation have been found several thousand kilometres away in West Asia.

The term Indus script (also Harappan script) refers to short strings of symbols associated with the Indus Valley Civilization, in use during the Mature Harappan period, between the 26th and 20th centuries BC. It is not generally accepted that these symbols form a script used to record a language, and the subject remains controversial. In spite of many attempts at decipherments and claims, it is as yet undeciphered. The underlying language has not been identified, primarily due to the lack of a bilingual inscription.

The first publication of a Harappan seal dates to 1873, in a drawing by Alexander Cunningham. Since then, over 4000 symbol-bearing objects have been discovered, some as far afield as Mesopotamia. In the early 1970s, Iravatham Mahadevan published a corpus and concordance of Indus writing listing about 3700 seals and about 417 distinct signs in specific patterns. The average inscription contain five signs, and the longest inscription is only 17 signs long. He also established the direction of writing as right to left.

Some early scholars, starting with Cunningham in 1877, thought that the script was the archetype of the Brāhmī script. Cunningham's ideas were supported by G.R. Hunter, Mahadevan and a minority of scholars, who continue to argue for the Indus script as the predecessor of the Brahmic family. However most scholars disagree, claiming instead that the Brahmi script derived from the Aramaic script.

**Corpus**

Early examples of the symbol system are found in an Early Harappan context, dated to as early as the 33rd century BC in a BBC report of 1999. In the Mature Harappan period, from about 2600 BC, strings of Indus signs are most commonly found on flat, rectangular stamp seals, but they are also found on at least a dozen other materials including tools, miniature tablets, copper plates, and pottery.

**Late Harappan**

After 1900 BC, the systematic use of the symbols ended, after the final stage of the Mature Harappan civilization. A few Harappan signs have been
claimed to appear until as late as around 1100 BC (the beginning of the Indian Iron Age). Onshore explorations near Bet Dwarka in Gujarat revealed the presence of late Indus seals depicting a 3-headed animal, earthen vessel inscribed in what is claimed to be a late Harappan script, and a large quantity of pottery similar to Lustrous Red Ware bowl and Red Ware dishes, dish-on-stand, perforated jar and incurved bowls which are datable to the 16th century BC in Dwarka, Rangpur and Prabhas. The thermoluminescence date for the pottery in Bet Dwaraka is 1528 BC. This evidence has been used to claim that a late Harappan script was used until around 1500 BC. Other excavations in India at Vaisali, Bihar and Mayiladuthurai, Tamil Nadu have been claimed to contain Indus symbols being used as late as 1100 BC.

In May 2007, the Tamil Nadu Archaeological Department found pots with arrow-head symbols during an excavation in Melaperumpallam near Poompuhar. These symbols are claimed to have a striking resemblance to seals unearthed in Mohenjo-daro in the 1920s. In one alleged "decipherment" of the script, the Indian archeologist S. R. Rao argued that the late phase of the script represented the beginning of the alphabet. He notes a number of striking similarities in shape and form between the late Harappan characters and the Phoenician letters, arguing than the Phoenician script evolved from the Harappan script, challenging the classical theory that the first alphabet was Proto-Sinaitic.

**Characteristics**

The writing system is largely pictorial but includes many abstract signs as well. The script is thought to have been mostly written from right to left, but sometimes follows a boustrophedonic style. The number of principal signs is about 400-600, comparable to the typical sign inventory of a logo-syllabic script. The prevailing scholarly view maintains that structural analysis indicates that the language is agglutinative, like the Dravidian languages.

According to a paper by researchers doing a comprehensive analysis of Indus signs at TIFR & published in Korean journal Scripta, it took a significant time & effort, intellect, aesthetics, detailed planning and cares to design the Indus script. It was acceptable all across the civilization & combining signs or combining signs with modifiers seems to have been done at all sites.

**Decipherability question**

In a 2004 article, Farmer, Sproat, and Witzel presented a number of arguments in support of their thesis that the Indus script is nonlinguistic, principal among them being the extreme brevity of the inscriptions, the existence of too many rare signs increasing over the 700-year period of the Mature Harappan civilization, and the lack of random-looking sign repetition typical for
representations of actual spoken language (whether syllabic-based or letter-based), as seen, for example, in Egyptian cartouches.

Asko Parpola, reviewing the Farmer, Sproat, and Witzel thesis in 2005, states that their arguments "can be easily controverted". He cites the presence of a large number of rare signs in Chinese, and emphasizes that there is "little reason for sign repetition in short seal texts written in an early logo-syllabic script". Revisiting the question in a 2007 lecture, Parpola takes on each of the 10 main arguments of Farmer et al., presenting counterarguments for each. He states that "even short noun phrases and incomplete sentences qualify as full writing if the script uses the rebus principle to phonetize some of its signs".

A computational study conducted by a joint Indo-US team led by Rajesh P N Rao of the University of Washington, consisting of Iravatham Mahadevan and others from the Tata Institute of Fundamental Research and the Institute of Mathematical Sciences, was published in April 2009 in Science. They conclude that "given the prior evidence for syntactic structure in the Indus script, (their) results increase the probability that the script represents language". Farmer, Sproat, and Witzel have disputed this finding, pointing out that Rao et al. did not actually compare the Indus signs with "real-world non-linguistic systems" but rather with "two wholly artificial systems invented by the authors". In response, Rao et al. point out that the two artificial systems "simply represent controls, necessary in any scientific investigation, to delineate the limits of what is possible." They state that real-world non-linguistic systems were indeed included in their analysis ("DNA and protein sequences, FORTRAN computer code"). Farmer et al. have also compared a non-linguistic system (medieval heraldic signs) with natural languages using Rao et al.'s method and conclude that the method cannot distinguish linguistic systems from non-linguistic ones. Rao et al. have clarified that their method is inductive, not deductive as presumed by Farmer et al., and their result, together with other known attributes of the script, increases the evidence that the script is linguistic, though it does not prove it. In a follow-up study published in IEEE Computer, Rao et al. present data which strengthen their original conditional entropy result, which involved analysis of pairs of symbols. They show that the Indus script is similar to linguistic systems in terms of block entropies, involving sequences up to 6 symbols in length.

A discussion of the linguistic versus nonlinguistic question by Sproat, Rao, and others was published in the journal Computational Linguistics in December 2010.
Attempts at decipherment

Over the years, numerous decipherments have been proposed, but none has been accepted by the scientific community at large. The following factors are usually regarded as the biggest obstacles for a successful decipherment:

- The underlying language has not been identified though some 300 loanwords in the Rigveda are a good starting point for comparison. The average length of the inscriptions is less than five signs, the longest being only 17 signs (and a sealing of combined inscriptions of just 27 signs).

- No bilingual text (like a Rosetta stone) have been found.

The topic is popular among amateur researchers, and there have been various (mutually exclusive) decipherment claims. None of these suggestions has found academic recognition.

Dravidian hypothesis

The Russian scholar Yuri Knorozov surmised that the symbols represent a logosyllabic script and suggested, based on computer analysis, an underlying agglutinative Dravidian language as the most likely candidate for the underlying language. Knorozov’s suggestion was preceded by the work of Henry Heras, who suggested several readings of signs based on a proto-Dravidian assumption.

The Finnish scholar Asko Parpola led a Finnish team in the 1960s-80s that vied with Knorozov’s Soviet team in investigating the script using computer analysis. Based on a proto-Dravidian assumption, they proposed readings of many signs, some agreeing with the suggested readings of Heras and Knorozov (such as equating the “fish” sign with the Dravidian word for fish “min”) but disagreeing on several other readings. A comprehensive description of Parpola’s work until 1994 is given in his book ‘Deciphering the Indus Script’.

The discovery in Tamil Nadu of a late Neolithic (early 2nd millennium BC, i.e. post-dating Harappan decline) stone celt allegedly marked with Indus script signs has been considered by some to be significant for the Dravidian identification. However, their identification as Indus signs has been disputed. Iravatham Mahadevan, who supports the Dravidian hypothesis, says, “We may hopefully find that the proto-Dravidian roots of the Harappan language and South Indian Dravidian languages are similar. This is a hypothesis... but I have no illusions that I will not decipher the Indus script, nor do I have any regret.”
"Sanskritic" hypothesis

Shikaripura Ranganatha Rao claimed to have deciphered the Indus script. Postulating uniformity of the script over the full extent of Indus-era civilization, he compared it to the Phoenician Alphabet, and assigned sound values based on this comparison. His decipherment results in an "Sanskritic" reading, including the numerals aeka, tra, chatus, panta, happta/sapta, dasa, dvadasa, sata (1, 3, 4, 5, 7, 10, 12, 100).

While mainstream scholarship is generally in agreement with Rao's approach of comparison, the details of his decipherment have not been accepted, and the script is still generally considered undeciphered. John E. Mitchiner, after dismissing some more fanciful attempts at decipherment, mentions that "a more soundly-based but still greatly subjective and unconvincing attempt to discern an Indo-European basis in the script has been that of Rao". In a 2002 interview with The Hindu, Rao asserted his faith in his decipherment, saying that "Recently we have confirmed that it is definitely an Indo-Aryan language and deciphered. Prof. W. W. Grummond of Florida State University has written in his article that I have already deciphered it."

Chola and Vijayanagara Inscriptions

Cliometric projects on the Indus are undertaken to decipher an unknown writing system. In the South Indian context it is applied to known inscriptions and scripts for purpose of eliciting more information. Information technology is profitably harnessed to resolve many related issues like copying, storing, retrieval, decipherment, concordance and analysis of this unbound database. When the colonial writers inaugurated the historical studies on India, South India remained largely a tag of the history of North India. The early histories of South India as told by its own historians like K.A. Nilakanta Sastri, Appadorai and T.V. Mahalingam were confined to Aryan – Sanskritic traditions. They are marked by their Brahminical overtones. The major advantage of these pioneering works was that they could present a descriptive story of administrative history in a chronological framework. New tools for socio-cultural and economic analysis or models of western theories had not bothered their traditional ideas.

Computer aided statistical analysis of South Indian inscriptions brought a new energy in the field. It was started under the supervision of America and Japanese scholars who were more familiar with the tools and applications of IT and a few South Indian scholars collaborated with them enthusiastically. Later many joint projects were taken up. Output of most of these programs are now available in published form which can be reviewed or refused by anybody who is
more familiar with the totality of the regional culture. It has opened new horizons of a research on the early history of South India.

Recent studies in the history of Cholas of South India Burton Stein, Professor N.Karashima and George W.Spencer are marked by their methodology supported by IT. They have reviewed the existing status of South Indian studies, organized new formulations on the basis of sociological theories and tried to substantiate their validity with the help of computer analysis of the sources, mainly the inscriptions. This helped them to put forward the theoretical interpretations of the Peasant Society and Segmentary Model. However, their critics, like Professors Champakalakshmi, D.N.Jha and M.G.S. Narayananan, were unanimous in pointing out that they mixed up the ‘Aryan historical context’ with Western sociological theories and a ‘few facts selected at random’. They also exposed the contradictions in their theoretical presentations disregarding the evidences offered in the light of the lessons of the regional culture. Identifying the Chola state as one that thrived on ‘plunder economy’ inspite of the existence of an organized revenue system was such a mistake.

Besides these theoretical attempts, works like ‘A Concordance of the Names in the Chola Inscriptions’ by Noboru Karashima, Y.Subbarayalu and Toru Matsui had used almost all the 3168 Chola inscriptions published in Tamil. The inscriptions collected from 7 districts provide the basis for the preparation of the concordance of names. Yet another important work was the ‘South Indian History and Society Studies from Inscriptions A.D.850- 1800’ by Noboru Karashima. This volume contains 13 papers published elsewhere.Other studies include the research done by N.Karashima and B.Sitaraman on the revenue terms on Cola inscriptions. Many of the findings in the area of Chola inscriptions have been extended and tested in the context of the studies conducted by the same team on Pandya and Vijayanagara inscriptions as well. The teamwork of Professors Karashima, Y. Subbarayalu and P. Shanmugam on the revenue terms of Pandya inscriptions from Tiruchirappalli and Pudokkottai districts can be treated as a pilot project. Some of the works on Vijayanagara inscriptions may be examined in the light of their valuable insights for new interpretations of the contemporary history. Noboru Karashima initiated a joint research project on the “Socio – economic development in South India from the 13th century through the 18th century in 1984. This study on the Vijayanagara inscriptions was supported by the Institute for the Study of Languages and Cultures of Asia and Africa, Tokyo. It was conducted both in India and Japan under the aegis of the Mitusbishi Foundation and the Indian Council of Historical Research. The Indian part of the work was carried out by Professors Y. Subbarayalu, and Dr. P. Shanmuham.
The work which was processed both in India and Japan mainly used the collection of unpublished inscriptions preserved in the office of the Chief Epigraphist, Mysore. A report of the project work was published as “Vijayanar Rule in Tamil Country as revealed through a Statistical Study of Revenue Terms in Inscriptions”.

The Vijayanagar Inscriptions in South India brought out by Noboru Karashima in 2002 is a remarkable example for computer assisted research. Karashima used statistical tools to examine 568 Tamil Inscriptions, ranging from 15th to 17th century, dealing with various grants, revenue transactions and irrigation works. There are also references to disputes and mediations involving Nayaka ‘brahmans’. Karashima could identify 1030 names of Nayakas in these writings which enabled further analysis. The Nayakas were state administrators and revenue collectors who played a very important role in Vijayanagara kingdom. This revealing study offers a better understanding of the nature of the Vijayanagara State by tracking the roles of the Nayaka functionaries. Karashima’s work could modify the former interpretations by Burton Stein treating the Nayakas as local chieftains or intruding warriors. The computer analysis provided detailed data pertaining to a crucial period in the history of the Vijayanagara kingdom and South India. Only one-third of the collection of inscriptions was tabulated by Karashima. Rest of them is still unpublished and remains for computer assisted analysis. As we have seen, Karashima’s works based on the gleanings from thousands of Tamil inscriptions, shifted the emphasis of South Indian history from political descriptions to economic analysis and witnessed the emergence of a new academic order.

Computer aided statistical method was used in many works brought out by them. They addressed various aspects of the revenue system in general. It was also tried to track the administrative changes under different dynasties on the basis of chronological and territorial bearing of the tabulated terms. This was quite easy because of the computer aided error-free classification and sorting of data. Observations of the fluctuation in the frequency of specific revenue terms and the increase in the types of taxes explained the different stages of the corresponding political developments. These classified tabular data enabled machine aided comparison of the occurrence of each term in other regions at various periods yielding insights into socio-economic changes. These studies naturally challenged the European view of India as a changeless spiritualistic society. Such results call for complete digitization of all available inscriptions. When concordances are generated and quantification is done, it will be available to all for further verification of earlier interpretation leading to more original studies.
Excel

Excel is an electronic spreadsheet program that can be used for storing, organizing and manipulating data. In other words, Microsoft Excel is a spreadsheet program which allows one to enter numerical values or data into the rows or columns of a spreadsheet, and to use these numerical entries for such things as calculations, graphs, and statistical analysis.

Why use Excel?

Spreadsheets (like Microsoft Excel) can be very useful for student interactive activities, interactive lectures, and instructor use for developing materials for class. Example aspects of spreadsheets that are relevant to science education are:

- Using Excel as a calculator to explore what mathematical equations can tell us about how the real world works for specific input conditions or for a range of possible values.
- The calculator can be pre-constructed with a focus on student exploration or students can be guided to construct their own calculators and then explore. The first option saves time but the second option prepares students to use Excel for their own projects and future activities.
- Graphically displaying equations (analytical models) and real data.
- Obtaining numerical solutions to more mathematically complex models.
- Graphically comparing results from a model and observations.
- Statistical analysis including mean, standard deviation, and error bars on graphs, linear and polynomial fits, multivariate analysis, etc.
- Spectral analysis (Fast Fourier Transforms).
- Displaying histograms of students’ results or student response to exams or questions.

New equipment and techniques in Archaeology

Archaeology is the study of human cultures through the recovery documentation and analysis of material remains including architecture, artefacts, biofacts, human remains and landscapes. The goal of archaeology is to shed light on long-term human pre-history, history behaviour and cultural evolution. It is the only discipline which possesses the method and theory for the collection and interpretation of information about the pre-written human past and can also make a critical contribution to our understanding of documented societies.
For many, this simple and obvious fact makes the subject a humanity or social science and distinguishes it sharply from hard sciences such as physics or chemistry. Yet modern archaeology uses a wide range of scientific aids, and a great deal of what we discover about the past comes directly from the application of technology. Here as much as anywhere, the last 50 years have seen enormous changes. Archaeology has benefited from the growing computerization of society; advances in nuclear physics, like electron microscopes and particle accelerators; and the development of laser technology used in sophisticated and highly accurate surveying equipment. Meanwhile, DNA analysis is opening up possibilities for studying relationships among people buried in ancient cemeteries, detecting the arrival of immigrant groups, and more. This, in turn, links directly with ideas of ethnicity and identity, among the hottest topics in politics today. It is all part of the great transformation of archaeology from an amateur pursuit with relatively few salaried full-timers to a highly professional discipline employing thousands of university-trained specialists. Men and women in white coats, toiling away in their laboratories, have become as important as rugged fieldworkers slogging away under the hot sun.

The introduction of new techniques of many and varied kinds is perhaps archaeology’s greatest success of the past 50 years. The discipline remains at heart a humanity or social science, but the new techniques allow archaeologists to ask new questions and to get new answers to old ones, squeezing ever more information out of a dwindling number of sites, as growing numbers of them are lost to development, looting, and natural processes such as erosion. But this technology doesn’t come cheap. As archaeology becomes more and more sophisticated and better tooled, it also becomes more expensive, and as the quest for adequate funding becomes more intense, so does the need to convince the world at large that it is worth the cost.

Academic websites

While academic institutions have always used their websites to attract students, recent trends have shown that departments, laboratories and facilities are recognizing that websites and web-based, database-backed applications can help them in their daily functions.

The look of a website simply is not sufficient anymore. Up-to-date information and the ability for administrators and faculty to update their own profiles, publications and daily seminars and events is becoming increasingly important to attract prospective and service current students. Paper applications and written requests for information are becoming obsolete - as are service requests and laboratory orders submitted by hand. Academia has been, and will
continue to, push towards efficiency and convenience as everyone around them moves forward in the digital age.

**JSTOR**

**JSTOR** (short for *Journal Storage*) is an online system for archiving academic journals, founded in 1995. It provides its member institutions full-text searches of digitized back issues of several hundred well-known journals, dating back to 1665 in the case of the Philosophical Transactions of the Royal Society. Membership in JSTOR is held by 7,000 institutions in 159 countries. JSTOR was originally funded by the Andrew W. Mellon Foundation, but is now an independent, self-sustaining not-for-profit organization with offices in New York City and Ann Arbor, Michigan. In January 2009 JSTOR merged with ITHAKA becoming part of that organization. The latter is a non-profit organization founded in 2003 "dedicated to helping the academic community take full advantage of rapidly advancing information and networking technologies."

JSTOR was originally conceived as a solution to one of the problems faced by libraries, especially research and university libraries, due to the increasing number of academic journals in existence. The founder, William G. Bowen, was the president of Princeton University from 1972 to 1988. Most libraries found it prohibitively expensive in terms of cost and space to maintain a comprehensive collection of journals. By digitizing many journal titles, JSTOR allowed libraries to outsource the storage of these journals with the confidence that they would remain available for the long term. Online access and full-text search ability improved access dramatically. JSTOR originally encompassed ten economics and history journals and was initiated in 1995 at seven different library sites. As of November 2010, there were 6,425 participating libraries. JSTOR access was improved based on feedback from these sites and it became a fully searchable index accessible from any ordinary Web browser. Special software was put in place to make pictures and graphs clear and readable.

With the success of this limited project, Bowen and Kevin Guthrie, then-president of JSTOR, were interested in expanding the number of participating journals. They met with representatives of the Royal Society of London, and an agreement was made to digitize the Philosophical Transactions of the Royal Society back to its beginning in 1665. The work of adding these volumes to JSTOR was completed by December 2000. As of November 2, 2010, the database contained 1,289 journal titles in 20 collections representing 53 disciplines, and 303,294 individual journal issues, totaling over 38 million pages of text.
JSTOR is a not-for-profit service that enables discovery, access, and preservation of scholarly content. It collaborates with the academic community to achieve the following goals:

a) Help scholars, researchers, and students discover, use, and build upon a wide range of scholarly content on a dynamic platform that increases productivity and facilitates new forms of scholarship.

b) Help libraries connect patrons to vital content while increasing shelf-space savings and lowering costs.

c) Help publishers reach new audiences and preserve their scholarly content for future generations.

KCHR

Kerala Council for Historical Research [KCHR] is an autonomous institution committed to scientific research in history and social sciences. Funded by the Ministry of Cultural Affairs, Government of Kerala, KCHR is a recognised research centre of the University of Kerala. KCHR is located at Thiruvananthapuram, the capital city of Kerala State, India, in the multi-purpose cultural complex Vyloppilly Samskrithi Bhavan, at Nalanda. It is housed in the blocks dedicated to the memory of pioneering researchers of Kerala history, Sri.K.P.Padmanabha Menon and Prof. Elamkulam Kunjan Pillai.

KCHR offers doctoral, post-doctoral and internship programmes and short term courses in social theory, research methods, epigraphy, palaeography and numismatics. Research, publication, documentation, training and co-ordination are the major domains of KCHR activities. KCHR has a well-equipped library and research resource centre with a fairly large collection of books on Kerala history and society. KCHR publications include twenty-seven volumes on Kerala society that are of vital research significance. KCHR has a three tier organizational set up with a Patrons Council, Advisory Council and Executive Council.

The Chairman of KCHR is Prof. K.N.Panikkar, former Professor and Dean, School of Social Sciences, Jawaharlal Nehru University, New Delhi and former Vice-Chancellor, Sree Sankaracharya University, Kalady. The Director is Prof. P.J.Cherian, former State Editor, Gazetteers Department and Professor of History, Union Christian College, Alwaye. The Executive Council of KCHR has nine distinguished social scientists along with the Principal Secretaries of the Departments of Culture and Finance, Government of Kerala and the Directors of the State Archaeology and Archives Departments, Government of Kerala.
Aims and Objectives

- To form a forum of professional historians to promote research and exchange of ideas on history;
- To create a comprehensive worldwide database of research on Kerala History;
- To publish source materials and studies to further historical research;
- To set up a library and resource centre with the latest facilities;
- To identify important research areas and initiate and encourage research in those areas;
- To organise and sponsor seminars, workshops and conferences for the promotion and dissemination of historical knowledge;
- To institute and administer fellowships, scholarships and sponsorships on historical research;
- To provide professional advice and direction for the proper conservation of archival materials and archaeological artefacts as a nodal agency of the State Archives Department and the Archaeology Department;
- To facilitate exchange programmes for teachers and scholars of history to provide exposure to advanced scholarly practices;
- To attempt to historicise areas like science, technology, industry, music, media etc. conventionally held to be beyond the range of historical analysis;
- To assist and aid the Education Department in restructuring history curricula and syllabi, so as to instil the critical component in teaching and learning practices;
- To restore local history to its rightful position and help set up local museums and archives;
- To develop popular and non-reductive modes of historical writing;
- To undertake the publication of a research journal on Kerala History;
- To optimally utilise the electronic media and information technology in the dissemination of historical knowledge worldwide;
- To undertake projects entrusted by the Government.

**British Museum**

The British Museum, in London, is widely considered to be one of the world’s greatest museums of human history and culture. Its permanent
collection, numbering some eight million works, is amongst the finest, most comprehensive, and largest in existence and originates from all continents, illustrating and documenting the story of human culture from its beginnings to the present.

The British Museum was established in 1753, largely based on the collections of the physician and scientist Sir Hans Sloane. The museum first opened to the public on 15 January 1759 in Montagu House in Bloomsbury, on the site of the current museum building. Its expansion over the following two and a half centuries was largely a result of an expanding British colonial footprint and has resulted in the creation of several branch institutions, the first being the British Museum (Natural History) in South Kensington in 1887. Some objects in the collection, most notably the Elgin Marbles from the Parthenon, are the objects of intense controversy and of calls for restitution to their countries of origin.

Until 1997, when the British Library (previously centred on the Round Reading Room) moved to a new site, the British Museum was unique in that it housed both a national museum of antiquities and a national library in the same building. The museum is a non-departmental public body sponsored by the Department for Culture, Media and Sport, and as with all other national museums in the United Kingdom it charges no admission fee. Since 2002 the director of the museum has been Neil MacGregor.

**Forums**

An Internet forum is a discussion area on a website. Website members can post discussions and read and respond to posts by other forum members. An Internet forum can be focused on nearly any subject and a sense of an online community, or virtual community, tends to develop among forum members.

An Internet forum is also called a message board, discussion group, bulletin board or web forum. However, it differs from a blog, the name for a web log, as a blog is usually written by one user and usually only allows for the responses of others to the blog material. An Internet forum usually allows all members to make posts and start new topics.

An Internet forum is also different from a chat room. Members in a chat room usually all chat or communicate at the same time, while members in an Internet forum post messages to be read by others whenever they happen to log on. Internet forums also tend to be more topic-focused than chat rooms.

Before a prospective member joins an Internet forum and makes posts to others, he or she is usually required to register. The prospective member must
usually agree to follow certain online rules, sometimes called *netiquette*, such as to respect other members and refrain from using profanity. When a member is approved by the administrator or moderator of the Internet forum, the member usually chooses his or her own user name and password. Sometimes, a password is supplied. An avatar, or photograph or picture, supplied by the member can appear under the member’s user name in each post.

The separate conversations in an Internet forum are called threads. Threads are made up of member-written posts. Internet forum members can usually edit their own posts, start new topics, post in their choice of threads and edit their profile. A profile usually lists optional information about each forum member such as the city they are located in and their interests.

An Internet forum administrator or monitor may also participate in the forum. A forum administrator can usually modify threads as well as move or delete threads if necessary. Administrators can also usually change software items in an Internet forum. Moderators often help the administrator and moderate Internet forum members to make sure the forum rules are being followed.

Internet forum software packages are written in many different program languages. Perl, PHP, ASP and Java are common programming languages used in Internet forums. Either text files or a data base can be used for the configuration and storage of posts in the forum.

**Internet Relay Chat (IRC)**

**Internet Relay Chat (IRC)** is a chat system on the Internet. It allows people from around the world to have conversations together, but it can also be used for two people to chat privately. The IRC chat rooms are also called *IRC channels*. These channels are on IRC servers, which you can connect to by finding that server’s information. This information will often begin with "irc," then a period, the name of the server, then another period, and finally, .com .org or .net. An example would be 'irc.[Servername].org'

There are small IRC servers (for example, OperaNet) to medium IRC servers (freenode and DalNet, which have about 30,000 users) and big IRC servers (for example, EFNet, UnderNet, which have over 100,000 users). An IRC client is needed to use IRC. An IRC client is a computer program designed to work with IRC. There are many Java web browser based clients as well as application based. Popular stand-alone clients include mIRC for Microsoft Windows and XChat for Linux and Microsoft Windows. The Opera web browser has an IRC client built into the browser. ChatZilla is a chat client which is a plugin to Mozilla Firefox.
IRC bots are computer programs used to help control and protect channels. IRC channels usually begin with a hash (#). It was used by thousands of people to discuss the September 11 attacks on the day it happened. IRC is an open protocol that uses TCP and optionally TLS. An IRC server can connect to other IRC servers to expand the IRC network. Users access IRC networks by connecting a client to a server. There are many client and server programs, such as mIRC and the Bahamut IRCd, respectively. Most IRC servers do not require users to log in, but a user will have to set a nickname before being connected.

IRC was originally a plain text protocol (although later extended), which on request was assigned port 194/TCP by IANA. However, most servers now run IRC on 6667/TCP and nearby port numbers (for example TCP ports 6112-6119) so that the server does not have to be run with root privileges.

OpenStreetMap

OpenStreetMap (OSM) is a collaborative project to create a free editable map of the world. Two major driving forces behind the establishment and growth of OSM have been restrictions on use or availability of map information across much of the world and the advent of inexpensive portable Satellite navigation devices. The maps are created using data from portable SAT NAV devices, aerial photography, other free sources or simply from local knowledge. Both rendered images and the vector dataset are available for download under a Creative Commons Attribution-ShareAlike 2.0 licence.

The OpenStreetMap approach to mapping was inspired by sites such as Wikipedia; the map display features a prominent "Edit" link and a full revision history is maintained. Registered users can upload GPS track logs and edit the vector data using free GIS editing tools like JOSM. Various mobile applications also allow contribution of GPX tracks to the OSM project.

History

OpenStreetMap (OSM) was founded in July 2004 by Steve Coast. In April 2006, the OpenStreetMap Foundation (OSMF) was established to encourage the growth, development and distribution of free geospatial data and provide geospatial data for anybody to use and share. In December 2006, Yahoo confirmed that OpenStreetMap could use its aerial photography as a backdrop for map production.

In April 2007, Automotive Navigation Data (AND) donated a complete road data set for the Netherlands and trunk road data for India and China to the project and by July 2007, when the first OSM international The State of the Map conference was held, there were 9,000 registered users. Sponsors of the event included Google, Yahoo and Multimap. In August 2007, an independent project,
OpenAerialMap, was launched, to hold a database of aerial photography available on open licensing and in October 2007, OpenStreetMap completed the import of a US Census TIGER road dataset. In December 2007, Oxford University became the first major organisation to use OpenStreetMap data on their main website.

In January 2008, functionality was made available to download map data into a GPS unit for use by cyclists. In February 2008, a series of workshops were held in India. In March, two founders announced that they have received venture capital funding of 2.4M euros for CloudMade, a commercial company that will use OpenStreetMap data.

**Blog**

A **blog** (a portmanteau of the term *web log*) is a personal journal published on the World Wide Web consisting of discrete entries ("posts") typically displayed in reverse chronological order so the most recent post appears first. Blogs are usually the work of a single individual, occasionally of a small group, and often are themed on a single subject. *Blog* can also be used as a verb, meaning to maintain or add content to a blog. The emergence and growth of blogs in the late 1990s coincided with the advent of web publishing tools that facilitated the posting of content by non-technical users. (Previously knowledge of such technologies as HTML and FTP had been required to publish content on the Web.)

Although not a must, most good quality blogs are interactive, allowing visitors to leave comments and even message each other via GUI widgets on the blogs and it is this interactivity that distinguishes them from other static websites. In that sense, blogging can be seen as a form of social networking. Indeed, bloggers do not only produce content to post on their blogs but also build social relations with their readers and other bloggers.

Many blogs provide commentary on a particular subject; others function as more personal online diaries; yet still others function more as online brand advertising of a particular individual or company. A typical blog combines text, images, and links to other blogs, Web pages, and other media related to its topic. The ability of readers to leave comments in an interactive format is an important part of many blogs. Most blogs are primarily textual, although some focus on art (art blog), photographs (photoblog), videos (video blogging or vlogging), music (MP3 blog), and audio (podcasting). Microblogging is another type of blogging, featuring very short posts. As of 16 February 2011; there were over 156 million public blogs in existence.

The term "weblog" was coined by Jorn Barger on 17 December 1997. The short form, "blog," was coined by Peter Merholz, who jokingly broke the word
weblog into the phrase we blog in the sidebar of his blog Peterme.com in April or May 1999. Shortly thereafter, Evan Williams at Pyra Labs used "blog" as both a noun and verb ("to blog," meaning "to edit one's weblog or to post to one's weblog") and devised the term "blogger" in connection with Pyra Labs' Blogger product, leading to the popularization of the terms.

Origins

Before blogging became popular, digital communities took many forms, including Usenet, commercial online services such as GEnie, BiX and the early CompuServe, e-mail lists and Bulletin Board Systems (BBS). In the 1990s, Internet forum software, created running conversations with "threads." Threads are topical connections between messages on a virtual "corkboard."

The modern blog evolved from the online diary, where people would keep a running account of their personal lives. Most such writers called themselves diarists, journalists, or journalers. Justin Hall, who began personal blogging in 1994 while a student at Swarthmore College, is generally recognized as one of the earlier bloggers, as is Jerry Pournelle. Dave Winer's Scripting News is also credited with being one of the older and longer running weblogs. Another early blog was Wearable Wireless Webcam, an online shared diary of a person's personal life combining text, video, and pictures transmitted live from a wearable computer and EyeTap device to a web site in 1994. This practice of semi-automated blogging with live video together with text was referred to as sousveillance, and such journals were also used as evidence in legal matters.

Early blogs were simply manually updated components of common Web sites. However, the evolution of tools to facilitate the production and maintenance of Web articles posted in reverse chronological order made the publishing process feasible to a much larger, less technical, population. Ultimately, this resulted in the distinct class of online publishing that produces blogs we recognize today. For instance, the use of some sort of browser-based software is now a typical aspect of "blogging". Blogs can be hosted by dedicated blog hosting services, or they can be run using blog software, or on regular web hosting services. Some early bloggers, such as The Misanthropic Bitch, who began in 1997, actually referred to their online presence as a zine, before the term blog entered common usage.

Rise in popularity

After a slow start, blogging rapidly gained in popularity. Blog usage spread during 1999 and the years following, being further popularized by the near-simultaneous arrival of the first hosted blog tools:
• Bruce Ableson launched Open Diary in October 1998, which soon grew to thousands of online diaries. Open Diary innovated the reader comment, becoming the first blog community where readers could add comments to other writers' blog entries.

• Brad Fitzpatrick started LiveJournal in March 1999.

• Andrew Smales created Pitas.com in July 1999 as an easier alternative to maintaining a "news page" on a Web site, followed by Diaryland in September 1999, focusing more on a personal diary community.

• Evan Williams and Meg Hourihan (Pyra Labs) launched blogger.com in August 1999 (purchased by Google in February 2003)

Political impact

An early milestone in the rise in importance of blogs came in 2002, when many bloggers focused on comments by U.S. Senate Majority Leader Trent Lott. Senator Lott, at a party honoring U.S. Senator Strom Thurmond, praised Senator Thurmond by suggesting that the United States would have been better off had Thurmond been elected president. Lott’s critics saw these comments as a tacit approval of racial segregation, a policy advocated by Thurmond’s 1948 presidential campaign. This view was reinforced by documents and recorded interviews dug up by bloggers. Though Lott's comments were made at a public event attended by the media, no major media organizations reported on his controversial comments until after blogs broke the story. Blogging helped to create a political crisis that forced Lott to step down as majority leader.

Similarly, blogs were among the driving forces behind the "Rathergate" scandal. To wit: (television journalist) Dan Rather presented documents (on the CBS show 60 Minutes) that conflicted with accepted accounts of President Bush’s military service record. Bloggers declared the documents to be forgeries and presented evidence and arguments in support of that view. Consequently, CBS apologized for what it said were inadequate reporting techniques. Many bloggers view this scandal as the advent of blogs' acceptance by the mass media, both as a news source and opinion and as means of applying political pressure.

The impact of these stories gave greater credibility to blogs as a medium of news dissemination. Though often seen as partisan gossips, bloggers sometimes lead the way in bringing key information to public light, with mainstream media having to follow their lead. More often, however, news blogs tend to react to material already published by the mainstream media. Meanwhile, an increasing number of experts’ blogged, making blogs a source of in-depth analysis.
In Russia, some political bloggers have started to challenge the dominance of official, overwhelmingly pro-government media. Bloggers such as Rustem Adagamov and Alexey Navalny have many followers and the latter's nickname for the ruling United Russia party as the "party of crooks and thieves" and been adopted by anti-regime protesters. This led to the Wall Street Journal calling Navalny "the man Vladimir Putin fears most" in March 2012.

**Mainstream popularity**

By 2004, the role of blogs became increasingly mainstream, as political consultants, news services, and candidates began using them as tools for outreach and opinion forming. Blogging was established by politicians and political candidates to express opinions on war and other issues and cemented blogs' role as a news source. Even politicians not actively campaigning, such as the UK's Labour Party's MP Tom Watson, began to blog to bond with constituents. In January 2005, Fortune magazine listed eight bloggers that business people "could not ignore": Peter Rojas, Xeni Jardin, Ben Trott, Mena Trott, Jonathan Schwartz, Jason Goldman, Robert Scoble, and Jason Calacanis.

Israel was among the first national governments to set up an official blog. Under David Saranga, the Israeli Ministry of Foreign Affairs became active in adopting Web 2.0 initiatives, including an official blog and a political blog. The Foreign Ministry also held a microblogging press conference via Twitter about its war with Hamas, with Saranga answering questions from the public in common text-messaging abbreviations during a live worldwide press conference. The questions and answers were later posted on IsraelPolitik, the country's official political blog.

The impact of blogging upon the mainstream media has also been acknowledged by governments. In 2009, the presence of the American journalism industry had declined to the point that several newspaper corporations were filing for bankruptcy, resulting in less direct competition between newspapers within the same circulation area. Discussion emerged as to whether the newspaper industry would benefit from a stimulus package by the federal government. President Barack Obama acknowledged the emerging influence of blogging upon society by saying "if the direction of the news is all blogosphere, all opinions, with no serious fact-checking, no serious attempts to put stories in context, then what you will end up getting is people shouting at each other across the void but not a lot of mutual understanding".

**Types**

There are many different types of blogs, differing not only in the type of content, but also in the way that content is delivered or written.
Personal blogs

The personal blog, an ongoing diary or commentary by an individual, is the traditional, most common blog. Personal bloggers usually take pride in their blog posts, even if their blog is never read. Blogs often become more than a way to just communicate; they become a way to reflect on life, or works of art. Blogging can have a sentimental quality. Few personal blogs rise to fame and the mainstream but some personal blogs quickly garner an extensive following. One type of personal blog, referred to as a microblog, is extremely detailed and seeks to capture a moment in time. Some sites, such as Twitter, allow bloggers to share thoughts and feelings instantaneously with friends and family, and are much faster than emailing or writing.

Corporate and organizational blogs

A blog can be private, as in most cases, or it can be for business purposes. Blogs used internally to enhance the communication and culture in a corporation or externally for marketing, branding or public relations purposes are called corporate blogs. Similar blogs for clubs and societies are called club blogs, group blogs, or by similar names; typical use is to inform members and other interested parties of club and member activities.

By genre

Some blogs focus on a particular subject, such as political blogs, health blogs, travel blogs (also known as travelogs), gardening blogs, house blogs, fashion blogs, project blogs, education blogs, niche blogs, classical music blogs, quizzing blogs and legal blogs (often referred to as a blawgs) or dreamlogs. Two common types of genre blogs are art blogs and music blogs. A blog featuring discussions especially about home and family is not uncommonly called a mom blog and one made popular is by Erica Diamond who created Womenonthefence.com which is syndicated to over two million readers monthly. While not a legitimate type of blog, one used for the sole purpose of spamming is known as a Splog.

By media type

A blog comprising videos is called a vlog, one comprising links is called a linklog, a site containing a portfolio of sketches is called a sketchblog or one comprising photos is called a photoblog. Blogs with shorter posts and mixed media types are called tumblelogs. Blogs that are written on typewriters and then scanned are called typecast or typecast blogs.

A rare type of blog hosted on the Gopher Protocol is known as a Phlog.
By device

Blogs can also be defined by which type of device is used to compose it. A blog written by a mobile device like a mobile phone or PDA could be called a moblog. One early blog was Wearable Wireless Webcam, an online shared diary of a person’s personal life combining text, video, and pictures transmitted live from a wearable computer and EyeTap device to a web site. This practice of semi-automated blogging with live video together with text was referred to as sousveillance. Such journals have been used as evidence in legal matters.

Reverse Blog

A Reverse Blog is composed by its users rather than a single blogger. This system has the characteristics of a blog, and the writing of several authors. These can be written by several contributing authors on a topic, or opened up for anyone to write. There is typically some limit to the number of entries to keep it from operating like a Web Forum.

Community and cataloging

The Blogosphere

The collective community of all blogs is known as the blogosphere. Since all blogs are on the internet by definition, they may be seen as interconnected and socially networked, through blogrolls, comments, linkbacks (refbacks, trackbacks or pingbacks) and backlinks. Discussions "in the blogosphere" are occasionally used by the media as a gauge of public opinion on various issues. Because new, untapped communities of bloggers can emerge in the space of a few years, Internet marketers pay close attention to "trends in the blogosphere".

Blog search engines

Several blog search engines are used to search blog contents, such as Bloglines, BlogScope, and Technorati. Technorati, which is among the more popular blog search engines, provides current information on both popular searches and tags used to categorize blog postings. The research community is working on going beyond simple keyword search, by inventing new ways to navigate through huge amounts of information present in the blogosphere, as demonstrated by projects like BlogScope.

Blogging communities and directories

Several online communities exist that connect people to blogs and bloggers to other bloggers, including BlogCatalog and MyBlogLog. Interest-specific blogging platforms are also available. For instance, Blogster has a sizable community of political bloggers among its members. Global Voices aggregates
international bloggers, "with emphasis on voices that are not ordinarily heard in international mainstream media."

**Blogging and advertising**

It is common for blogs to feature advertisements either to financially benefit the blogger or to promote the blogger’s favorite causes. The popularity of blogs has also given rise to "fake blogs" in which a company will create a fictional blog as a marketing tool to promote a product.

**Popularity**

Researchers have analyzed the dynamics of how blogs become popular. There are essentially two measures of this: popularity through citations, as well as popularity through affiliation (i.e. blogroll). The basic conclusion from studies of the structure of blogs is that while it takes time for a blog to become popular through blogrolls, permalinks can boost popularity more quickly, and are perhaps more indicative of popularity and authority than blogrolls, since they denote that people are actually reading the blog’s content and deem it valuable or noteworthy in specific cases.

The blogdex project was launched by researchers in the MIT Media Lab to crawl the Web and gather data from thousands of blogs in order to investigate their social properties. It gathered this information for over 4 years, and autonomously tracked the most contagious information spreading in the blog community, ranking it by recency and popularity. It can therefore be considered the first instantiation of a memetracker. The project is no longer active, but a similar function is now served by tailrank.com.

Blogs are given rankings by Technorati based on the number of incoming links and Alexa Internet based on the Web hits of Alexa Toolbar users. In August 2006, Technorati found that the most linked-to blog on the internet was that of Chinese actress Xu Jinglei. Chinese media Xinhua reported that this blog received more than 50 million page views, claiming it to be the most popular blog in the world. Technorati rated Boing Boing to be the most-read group-written blog.

**Blurring with the mass media**

Many bloggers, particularly those engaged in participatory journalism, differentiate themselves from the mainstream media, while others are members of that media working through a different channel. Some institutions see blogging as a means of "getting around the filter" and pushing messages directly to the public. Some critics worry that bloggers respect neither copyright nor the role of the mass media in presenting society with credible news. Bloggers and other
contributors to user-generated content are behind Time magazine naming their 2006 person of the year as "You". Many mainstream journalists, meanwhile, write their own blogs — well over 300, according to CyberJournalist.net’s J-blog list. The first known use of a blog on a news site was in August 1998, when Jonathan Dube of The Charlotte Observer published one chronicling Hurricane Bonnie.

Some bloggers have moved over to other media. The following bloggers (and others) have appeared on radio and television: Duncan Black (known widely by his pseudonym, Atrios), Glenn Reynolds (Instapundit), Markos Moulitsas Zúniga (Daily Kos), Alex Steffen (Worldchanging), Ana Marie Cox (Wonkette), Nate Silver (FiveThirtyEight.com), and Ezra Klein (Ezra Klein blog in The American Prospect, now in the Washington Post). In counterpoint, Hugh Hewitt exemplifies a mass-media personality who has moved in the other direction, adding to his reach in "old media" by being an influential blogger.

Blogs have also had an influence on minority languages, bringing together scattered speakers and learners; this is particularly so with blogs in Gaelic languages. Minority language publishing (which may lack economic feasibility) can find its audience through inexpensive blogging.

There are many examples of bloggers who have published books based on their blogs, e.g., Salam Pax, Ellen Simonetti, Jessica Cutler, and ScrappleFace. Blog-based books have been given the name blook. A prize for the best blog-based book was initiated in 2005, the Lulu Blooker Prize. However, success has been elusive offline, with many of these books not selling as well as their blogs. Only blogger Tucker Max made the New York Times Bestseller List. The book based on Julie Powell’s blog "The Julie/Julia Project" was made into the film Julie & Julia, apparently the first to do so.

**Consumer-generated advertising in blogs**

Consumer-generated advertising is a relatively new and controversial development and it has created a new model of marketing communication from businesses to consumers. Among the various forms of advertising on blog, the most controversial are the sponsored posts. These are blog entries or posts and may be in the form of feedback, reviews, opinion, videos, etc. and usually contain a link back to the desired site using a keyword/s. Blogs have led to some disintermediation and a breakdown of the traditional advertising model where companies can skip over the advertising agencies (previously the only interface with the customer) and contact the customers directly themselves. On the other hand, new companies specialised in blog advertising have been established, to take advantage of this new development as well.
However, there are many people who look negatively on this new development. Some believe that any form of commercial activity on blogs will destroy the blogosphere’s credibility.

**Legal and social consequences**

Blogging can result in a range of legal liabilities and other unforeseen consequences.

**Defamation or liability**

Several cases have been brought before the national courts against bloggers concerning issues of defamation or liability. U.S. payouts related to blogging totaled $17.4 million by 2009; in some cases these have been covered by umbrella insurance. The courts have returned with mixed verdicts. Internet Service Providers (ISPs), in general, are immune from liability for information that originates with third parties (U.S. Communications Decency Act and the EU Directive 2000/31/EC).

In *Doe v. Cahill*, the Delaware Supreme Court held that stringent standards had to be met to unmask the anonymous posts of bloggers and also took the unusual step of dismissing the libel case itself (as unfounded under American libel law) rather than referring it back to the trial court for reconsideration. In a bizarre twist, the Cahills were able to obtain the identity of John Doe, who turned out to be the person they suspected: the town’s mayor, Councilman Cahill’s political rival. The Cahills amended their original complaint, and the mayor settled the case rather than going to trial.

In January 2007, two prominent Malaysian political bloggers, Jeff Ooi and Ahiruddin Attan, were sued by a pro-government newspaper, The New Straits Times Press (Malaysia) Berhad, Kalimuthu bin Masheerul Hassan, Hishamuddin bin Aun and Brenden John a/l John Pereira over an alleged defamation. The plaintiff was supported by the Malaysian government. Following the suit, the Malaysian government proposed to "register" all bloggers in Malaysia in order to better control parties against their interest. This is the first such legal case against bloggers in the country.

In the United States, blogger Aaron Wall was sued by Traffic Power for defamation and publication of trade secrets in 2005. According to Wired Magazine, Traffic Power had been "banned from Google for allegedly rigging search engine results." Wall and other "white hat" search engine optimization consultants had exposed Traffic Power in what they claim was an effort to protect the public. The case addressed the murky legal question of who is liable for comments posted on blogs. The case was dismissed for lack of personal jurisdiction, and Traffic Power failed to appeal within the allowed time.
In 2009, a controversial and landmark decision by The Hon. Mr Justice Eady refused to grant an order to protect the anonymity of Richard Horton. Horton was a police officer in the United Kingdom who blogged about his job under the name "NightJack". In 2009, NDTV issued a legal notice to Indian blogger Kunte for a blog post criticizing their coverage of the Mumbai attacks. The blogger unconditionally withdrew his post, which resulted in several Indian bloggers criticizing NDTV for trying to silence critics.

**Employment**

Employees who blog about elements of their place of employment can begin to affect the brand recognition of their employer. In general, attempts by employee bloggers to protect themselves by maintaining anonymity have proved ineffective. Delta Air Lines fired flight attendant Ellen Simonetti because she posted photographs of herself in uniform on an airplane and because of comments posted on her blog "Queen of Sky: Diary of a Flight Attendant" which the employer deemed inappropriate. This case highlighted the issue of personal blogging and freedom of expression versus employer rights and responsibilities, and so it received wide media attention. Simonetti took legal action against the airline for "wrongful termination, defamation of character and lost future wages". The suit was postponed while Delta was in bankruptcy proceedings (court docket).

In early 2006, Erik Ringmar, a tenured senior lecturer at the London School of Economics, was ordered by the convenor of his department to "take down and destroy" his blog in which he discussed the quality of education at the school. Mark Cuban, owner of the Dallas Mavericks, was fined during the 2006 NBA playoffs for criticizing NBA officials on the court and in his blog.

Mark Jen was terminated in 2005 after 10 days of employment as an Assistant Product Manager at Google for discussing corporate secrets on his personal blog, then called 99zeros and hosted on the Google-owned Blogger service. He blogged about unreleased products and company finances a week before the company's earnings announcement. He was fired two days after he complied with his employer's request to remove the sensitive material from his blog.

In India, blogger Gaurav Sabnis resigned from IBM after his posts questioned the claims of a management school IIPM. Jessica Cutler, aka "The Washingtonienne", blogged about her sex life while employed as a congressional assistant. After the blog was discovered and she was fired, she wrote a novel based on her experiences and blog: *The Washingtonienne: A Novel*. Cutler is presently being sued by one of her former lovers in a case that could establish
the extent to which bloggers are obligated to protect the privacy of their real life associates.

Catherine Sanderson, a.k.a. Petite Anglaise, lost her job in Paris at a British accountancy firm because of blogging. Although given in the blog in a fairly anonymous manner, some of the descriptions of the firm and some of its people were less than flattering. Sanderson later won a compensation claim case against the British firm, however. On the other hand, Penelope Trunk wrote an upbeat article in the Boston Globe back in 2006, entitled "Blogs 'essential' to a good career". She was one of the first journalists to point out that a large portion of bloggers are professionals and that a well-written blog can help attract employers.

Political dangers

Blogging can sometimes have unforeseen consequences in politically sensitive areas. Blogs are much harder to control than broadcast or even print media. As a result, totalitarian and authoritarian regimes often seek to suppress blogs and/or to punish those who maintain them. In Singapore, two ethnic Chinese were imprisoned under the country’s anti-sedition law for posting anti-Muslim remarks in their blogs.

Egyptian blogger Kareem Amer was charged with insulting the Egyptian president Hosni Mubarak and an Islamic institution through his blog. It is the first time in the history of Egypt that a blogger was prosecuted. After a brief trial session that took place in Alexandria, the blogger was found guilty and sentenced to prison terms of three years for insulting Islam and inciting sedition, and one year for insulting Mubarak.

Egyptian blogger Abdel Monem Mahmoud was arrested in April 2007 for anti-government writings in his blog. Monem is a member of the then banned Muslim Brotherhood. After expressing opinions in his personal blog about the state of the Sudanese armed forces, Jan Pronk, United Nations Special Representative for the Sudan, was given three days notice to leave Sudan. The Sudanese army had demanded his deportation. In Myanmar, Nay Phone Latt, a blogger, was sentenced to 20 years in jail for posting a cartoon critical of head of state Than Shwe.

Personal safety

One consequence of blogging is the possibility of attacks or threats against the blogger, sometimes without apparent reason. Kathy Sierra, author of the innocuous blog "Creating Passionate Users", was the target of such vicious threats and misogynistic insults that she canceled her keynote speech at a technology conference in San Diego, fearing for her safety. While a blogger’s
anonymity is often tenuous, Internet trolls who would attack a blogger with threats or insults can be emboldened by anonymity. Sierra and supporters initiated an online discussion aimed at countering abusive online behavior and developed a blogger's code of conduct.

**Behavior**

The **Blogger's Code of Conduct** is a proposal by Tim O’Reilly for bloggers to enforce civility on their blogs by being civil themselves and moderating comments on their blog. The code was proposed due to threats made to blogger Kathy Sierra. The idea of the code was first reported by BBC News, who quoted O’Reilly saying, "I do think we need some code of conduct around what is acceptable behaviour, I would hope that it doesn't come through any kind of regulation it would come through self-regulation."

O’Reilly and others came up with a list of seven proposed ideas:

1. Take responsibility not just for your own words, but for the comments you allow on your blog.
2. Label your tolerance level for abusive comments.
3. Consider eliminating anonymous comments.
4. Ignore the trolls.
5. Take the conversation offline, and talk directly, or find an intermediary who can do so.
6. If you know someone who is behaving badly, tell them so.
7. Don’t say anything online that you wouldn’t say in person.

**Groupsites**

Groupsites are a powerful social collaboration tool for ordinary people in everyday groups. In other words Groupsites are inspiring the social collaboration movement by empowering ordinary people with self-serves, professional grade social networking and collaboration. Every day, a wide variety of people within companies, communities, education, government and non-profits create Groupsites to come together and make things happen.

For over three years, Groupsite.com (formerly known as CollectiveX) has been focused on empowering groups of all types and sizes to communicate, share and network - the universal requirements for making things happen within groups. Groupsite.com empowers groups to achieve this through social collaboration quickly, easily, securely and at an affordable cost.
Google Earth

Google Earth is a virtual globe, map and geographical information program that was originally called Earth Viewer 3D, and was created by Keyhole, Inc, a Central Intelligence Agency (CIA) funded company acquired by Google in 2004. It maps the Earth by the superimposition of images obtained from satellite imagery, aerial photography and GIS 3D globe. It was available under three different licenses, two currently: Google Earth, a free version with limited function; Google Earth Plus (discontinued), which included additional features; and Google Earth Pro ($399 per year), which is intended for commercial use.

The product, re-released as Google Earth in 2005, is currently available for use on personal computers running Windows 2000 and above, Mac OS X 10.3.9 and above, Linux kernel: 2.6 or later (released on June 12, 2006), and FreeBSD. Google Earth is also available as a browser plugin which was released on May 28, 2008. It was also made available for mobile viewers on the iPhone OS on October 28, 2008, as a free download from the App Store, and is available to Android users as a free app on the Android Market. In addition to releasing an updated Keyhole based client, Google also added the imagery from the Earth database to their web-based mapping software, Google Maps. The release of Google Earth in June 2005 to the public caused a more than tenfold increase in media coverage on virtual globes between 2004 and 2005, driving public interest in geospatial technologies and applications. As of October 2011 Google Earth has been downloaded more than a billion times.

For other parts of the surface of the Earth 3D images of terrain and buildings are available. Google Earth uses digital elevation model (DEM) data collected by NASA's Shuttle Radar Topography Mission (SRTM). This means one can view the whole earth in three dimensions. Since November 2006, the 3D views of many mountains, including Mount Everest, have been improved by the use of supplementary DEM data to fill the gaps in SRTM coverage.

Many people use the applications to add their own data, making them available through various sources, such as the Bulletin Board Systems (BBS) or blogs mentioned in the link section below. Google Earth is able to show all kinds of images overlaid on the surface of the earth and is also a Web Map Service client. Google Earth supports managing three-dimensional Geospatial data through Keyhole Markup Language (KML).

Google Earth is simply based on 3D maps, it has the capability to show 3D buildings and structures (such as bridges), which consist of users' submissions using SketchUp, a 3D modeling program software. In prior versions of Google Earth (before Version 4), 3D buildings were limited to a few cities, and had poorer
rendering with no textures. Many buildings and structures from around the world now have detailed 3D structures; including (but not limited to) those in the United States, Canada, Australia, Ireland, India, Japan, United Kingdom, Germany, Pakistan and the cities, Amsterdam and Alexandria. In August 2007, Hamburg became the first city entirely shown in 3D, including textures such as façades. The 'Westport3D' model was created by 3D imaging firm AM3TD using long-distance laser scanning technology and digital photography and is the first such model of an Irish town to be created. As it was developed initially to aid Local Government in carrying out their town planning functions it includes the highest resolution photo-realistic textures to be found anywhere in Google Earth. Three-dimensional renderings are available for certain buildings and structures around the world via Google's 3D Warehouse and other websites. Although there are many cities on Google Earth that are fully or partially 3D, more are available in the Earth Gallery. The Earth Gallery is a library of modifications of Google Earth people have made. In the library there are more than just modifications for 3D buildings there are models of earth quakes using the Google Earth model, 3D forests, and much more.

Recently Google added a feature that allows users to monitor traffic speeds at loops located every 200 yards in real-time. In version 4.3 released on April 15, 2008, Google Street View was fully integrated into the program allowing the program to provide an on the street level view in many locations. On January 31, 2010, the entirety of Google Earth’s ocean floor imagery was updated to new images by SIO, NOAA, US Navy, NGA, and GEBCO. The new images have caused smaller islands, such as some atolls in the Maldives, to be rendered invisible despite their shores being completely outlined.

**The Archaeological Survey of India (ASI)**

The Archaeological Survey of India (ASI), under the Ministry of Culture, is the premier organization for the archaeological researches and protection of the cultural heritage of the nation. Maintenance of ancient monuments and archaeological sites and remains of national importance is the prime concern of the ASI. Besides it regulates all archaeological activities in the country as per the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958. It also regulates Antiquities and Art Treasure Act, 1972.

For the maintenance of ancient monuments and archaeological sites and remains of national importance the entire country is divided into 24 Circles. The organization has a large work force of trained archaeologists, conservators, epigraphist, architects and scientists for conducting archaeological research projects through its Circles, Museums, Excavation Branches, Pre-history Branch,

**UNESCO&World Heritage**

Heritage is our legacy from the past, what we live with today, and what we pass on to future generations. Our cultural and natural heritages are both irreplaceable sources of life and inspiration. Places as unique and diverse as the wilds of East Africa’s Serengeti, the Pyramids of Egypt, the Great Barrier Reef in Australia and the Baroque cathedrals of Latin America make up our world’s heritage. What makes the concept of World Heritage exceptional is its universal application. World Heritage sites belong to all the peoples of the world, irrespective of the territory on which they are located.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) seek to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity. This is embodied in an international treaty called the Convention concerning the Protection of the World Cultural and Natural Heritage, adopted by UNESCO in 1972.

**UNESCO's World Heritage mission is to:**

- encourage countries to sign the World Heritage Convention and to ensure the protection of their natural and cultural heritage;
- encourage States Parties to the Convention to nominate sites within their national territory for inclusion on the World Heritage List;
- encourage States Parties to establish management plans and set up reporting systems on the state of conservation of their World Heritage sites;
- help States Parties safeguard World Heritage properties by providing technical assistance and professional training;
- provide emergency assistance for World Heritage sites in immediate danger;
- support States Parties' public awareness-building activities for World Heritage conservation;
- encourage participation of the local population in the preservation of their cultural and natural heritage;
- encourage international cooperation in the conservation of our world’s cultural and natural heritage.
The Internet Archive is a 501(c)(3) non-profit that was founded to build an Internet library. Its purposes include offering permanent access for researchers, historians, scholars, people with disabilities, and the general public to historical collections that exist in digital format. Founded in 1996 and located in San Francisco, the Archive has been receiving data donations from Alexa Internet and others. In late 1999, the organization started to grow to include more well-rounded collections. Now the Internet Archive includes texts, audio, moving images, and software as well as archived web pages in our collections, and provides specialized services for adaptive reading and information access for the blind and other persons with disabilities.

Questions

1. What you mean by SPSS?
2. What are the new features added in SPSS 16.0?
3. Explain SPSS base in detail.
4. Explain how you will calculate variance with the help of SPSS.
5. Explain the Reading of Indus script using Information Technology
6. What is the importance of ASI site?
7. What are the features of UNESCO Heritage sites?
SYLLABUS

HY1B03 - INFORMATICS AND HISTORY

No. of Credits: 4
No. of Contact Hours per week: 4

Aim of the course

To update an expand basic informatics skills and attitudes relevant to the emerging knowledge society and to equip the students to effectively utilize the digital knowledge resources for their chosen course of study. It is reality that the impact of this new technology and the ever increasing potential of its gadgets on the society cannot be neglected by the students of history.

Objective of the study

• To review the basic concept and function and knowledge in the field of Informatics.

• To understand what ICT is so as to explore its impact on society.

• To be able to learn and apply its basic techniques and models for learning and research in social sciences.

• To be able to register these innovations as a continuation of the break through of modern science.

• To be able to appreciate how these new generation gadgets bring changes in the traditional technology and systems.

UNIT I - Overview of Information Technology

• Technology and Society

• Historical Impact of modern scientific Break through - From Print culture to information Technology

• History of computers - Allied Gadgets and Peripherals - Digital Reprographic devices.

• Computer net works and internet Wireless Technology - ‘Cellular wireless Networks - Mobile Phone Technology- ATM.

• IT and society - issues and concerns - cyber ethics - cyber crime - guidelines for proper use of computers.
UNIT II - Introduction to Computer Basics and Knowledge Skill for Higher Education

- DOS - Windows - Open source
- Internet Access methods - Dial up - DSL - Cable - ISDN - WI - FI - Internet as a knowledge Repository - Academic Search Techniques - case study of academic websites.
- Basic Concepts of IPR - copy rights and patents - Introduction to the use of IT in teaching and learning - Academic Services - INFIIBNET - NICNET - BRNET

UNIT III - Computer Applications and Impact of ICT

- Word Processing - Spread sheets - Power point - Access - Internet.
- Introduction to DTP - Integration of Text and graphics.
- Field of influence - Health - Communication - Transport - Visual Meida.

UNIT IV - Contribution to Research in History and Important sites to Access

- Quantification and Analysis, Statistical Package for social sciences (SPSS)
- Data Analysis with Scilab and SPSS.
- Historical studies on Indus script - Works on Chola inscription and statistical study of Vijaya Nagara Inscriptions - Excel - Access.
- New equipment and techniques in Archaeology.
- Academic websites
- Jaxtr - Archaeology - Kerala History.org, KCHR, etc.
- Group sites - Geological sites.
- Google earth - ASI site - UNESCO Heritage site - Arch view programmes - www archives, etc.

Classroom Strategy

The whole units are to be delt with a very generic manner and can be taught by non-specialist teachers. Demonstrations, presentations, hands on experiences etc., are to be used wherever possible. Seminars, case studies and discussions are to be encouraged along with traditional lecture method. Final Exam should be written Exam only. It is well known that even the www is a product of war. Student of history must be given a chance to learn about the
historical background of the innovations in information technology and their ongoing impact leading to revolutionary changes in the society.

**Readings**


**Additional References**


Greg Perry, SAMS Teach Yourself open office Org. SAMS.


**Web Resources**

http://computer.howstuffworks.com

http://ezinearticles.com/?Understanding-The-Operation-Of-Mobile-Phone-Networks&id=68259


http://www.scribd.com/doc/259538/All-about-mobile-phones


www.computer.org/history/timeline

www.computerhistory.org

www.fgcu.edu/support/office2000

www.lgta.org *Office on-line lessons*

www.keralaitmission.org

www.learnthenet.com *Web Primer*

www.microsoft.com/office *MS Office web site*

www.openoffice.org. *Open Office Official Website*

www.technopark.org

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