CHAPTER – II

EVOLUTION OF ELECTRONIC MEDIA

Electronic media are media that use electronics or electro-mechanical energy for the end user (audience) to access the content. This is in contrast to static media (mainly print media), which are most often created electronically, but don’t require electronics to be accessed by the end user in the printed form. The primary electronic media sources familiar to the general public are better known as video recordings, audio recordings, multimedia presentations, slide presentations, CD-ROM and Online Content. Most new media are in the form of digital media. However, electronic media may be in either analog or digital format. Although the term is usually associated with content recorded on a storage medium, recordings are not required for live broadcasting and online networking.

Any equipment used in the electronic communication process (e.g. television, radio, telephone, desktop computer, game console, handheld device) may also be considered electronic media.

Brief History of Development

- **Transmission**
  - **Wire**
    - Telegraph 1795-1832
    - Facsimile 1843-1861
    - Telephone 1849-1877
    - Cable 1962 (Coaxial)

- **Signal Processing**
  - Capture 1745 (Capacitor)
  - Analog Encoding 1830's (morse code)
  - Electronic Modulating 1832-1927
  - Electronic Multiplexing 1853 (TDM)
  - Digitizing 1903 (PCM)
- **Standard Telephone**
  - Fiber Optics 1956-1970
- **Wireless**
  - Radio 1897-1920
  - Satellite 1958-1972
  - Free Space Optics 1960s
- **Internet**
  - Download 1969 (file transfer protocols)
  - Live Streaming 1996 (RTP Protocol)
- **Electronic Information Storage**
  - Electronic Encryption 1935-1945
  - Online Routing 1969
  - Electronic Programming 1943-current
- **Display and Output**
  - Information Processing 1940's (Term)
  - Galvanometer 1832
  - Telegraph Sounder 1844
  - Telephone Receiver 1849-1877
  - Light Bulb 1801-1883
  - Neon 1893-1902
  - Teletype Receiver 1910
  - CRT 1922
  - Radio/Television Tuner 1894-1927
  - Speaker/Headphones 1876-1928/1930s
  - Laser Light Show 1970s
  - Computer Monitor 1950s/1976 (for PCs)
  - Large Electronic Display 1985
  - HDTV 1936 (Term) 1990s (Standards)
  - HMD 1968-current
- **Recording Medium**
  - Punched card and Paper Tape 1725/1846
  - Phonograph Cylinder and Disk 1857-1958
  - Film 1876-1889
  - Magnetic Storage 1898-2003
  - RAM 1941-current
  - Barcodes 1952/1973 (UPC)
  - Laser Disc 1969-1978
  - Compact Disc/DVD 1982/1993-current
- **Content Formats**
  - Content in general 1877-current
  - Audio Recording 1877-current
  - Video Recording 1952-current
  - Digital File Formats
  - Database Content and Formats 1963-current
- **Interactivity**
  - Control Panel
  - Input Device
  - Game Controller
Electronic media are ubiquitous in most of the developed world. As of 2005, there are reports of satellite receivers being present in some of the most remote and inaccessible regions of China. Electronic media devices have found their way into all parts of modern life. The term is relevant to media ecology for studying its impact compared to printed media and broadening the scope of understanding media beyond a simplistic aspect of media such as one delivery platform (e.g. the World Wide Web) aside from many other options. The term is also relevant to professional career development regarding related skill sets.

Primary uses of Electronic Media:

- **Journalism**
  - News
- **Marketing**
  - Advertising
  - Graphic Design
- **Education**
  - Professional Training
- **Science**
- **Engineering**
- **Fine Art**
  - Video
  - Digital Photography
  - Digital Art
  - Experimental Music
- **Commerce**
  - Industry
  - Corporate Communications
  - Business Presentations
  - Telecommunications
- **Software Interfaces**
- **Computer Simulations**
- **Virtual Reality**
- **Entertainment**
  - Television
  - Video Games
  - Movies
  - Music
- **Government**
  - Infrastructure
  - Communications
  - Transportation
  - Public Services
  - Military
  - Nonprofit Services
Forms

Electronic media includes:

- Broadcasting, in the narrow sense, for radio and television.
- Many instances of various types of recorded discs or tapes. In the 20th century, these were mainly used for music. Video and computer uses followed.
- Film, most often used for entertainment, but also for documentaries.
- The Internet, which has many uses and presents both opportunities and challenges. Examples can include Blogs and podcasts (such as news, music, pre-recorded speech, and video)
- Mobile phones, which can be used for rapid breaking news and short clips of entertainment like jokes, horoscopes, alerts, games, music, and advertising
- Publishing, including electronic publishing
- Video games, which have developed into a mass form of media since cutting-edge devices such as the PlayStation 3, Xbox 360, and Wii broadened their use.

In the beginning, there was only voice for humans to express their thoughts; but voice remained mere noise for millions of years. Sounds arranged in a certain order to make sense is speech, but scientists say that human speech developed only some 35,000 years ago. Then came writing, although some form of pictorial representation through drawings on cave walls evolved in the centuries before writing through alphabets came into being in certain civilizations—Phoenician, Akkadian, Sumerian (all grouped under the Mesopotamian civilization), Egyptian, Chinese, Greek, Roman and Indian (Mohenjodaro and Harappa), to mention just a few.
The development of alphabets in different parts of the world occurred in the 4th or 5th millennium B. C. This was perhaps the second major revolution in communication, the first being the evolution of speech and the third the evolution of printing from movable type.

Words are but symbols and graphic records of sounds which, in turn, are but expressions of ideas. For many millennia, thoughts were expressed nonverbally. Then our ancestors sought means by which they could record their thoughts visually for fellow humans and future generations. They drew, and their drawings conveyed their thoughts in lines, circles, symbols and signs—in short, alphabets, and through alphabets, words.

The earliest form of writing was *pictographic*, with symbols or crude representations of objects familiar to the people of the same area. Not only objects but also ideas were thus represented; experts call them *pictograms* and *ideograms*.

*Cuneiform* script ('wedge-shaped' characters inscribed with a stylus on clay tablets) developed in the Mesopotamian region. Later on, cuneiform developed ideographic elements. The symbolic representations carried not only the object but ideas and qualities associated with the object. Gradually, vowel sounds were also represented by symbols.

Languages developed in different corners of the world during different eras and civilizations, first in speech and then in writing. There are now at least 3,000 languages and tens of thousands of dialects spoken in the world, but not all of them have scripts. Many of them do not have alphabets. Each manuscripts were 'illuminated' with intricately drawn

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pictures. Wooden blocks were used for illustrations in the early printed books. By the end of the 18th century, lithography (writing on stone—that is, engraving the letters on Hocks of stone) was replaced by printing from movable type made of wood or metal, first in China, then in Korea in the 9th or 10th century and in Europe after Johann Gutenberg started printing circa 1450. Gutenberg's invention revolutionized printing, because metallic movable types speeded up printing and led eventually to the democratization of communication throughout Europe and ultimately in various parts of the world. It also led to the quick and more permanent transmission of ideas and messages pertaining to business and manufacturing industries. 2

The generation of knowledge and the speedy dissemination of information throughout the world became easy because of the invention of various techniques and the improvement in technology during the long Industrial Revolution, that took place in the 17th, 18th and 19th centuries in Europe and the United States in full measure, and in other regions of the world in a partial manner. The end of this period saw the development of various media and processes of communication, including cinema (film), radio, telephone, telegraphy, wireless and television. The 20th century saw the fastest modes of telecommunication, namely, satellite communication, electronic mail and the Internet. All these branches of mass communication have received an immense boost from what we call visual communication.

In India, some of the manuscripts of famous epics, engraved by stylus on palm leaves, are illustrated. For example, the Ramayana recorded on palm leaves in 1483 and kept in the Manuscripts Library of the University

of Kerela, is a good example of early illustration of popular and religious works.\textsuperscript{3}

'Illustration' is visual material that explains and enhances the text with which it appears. An illustration could be a map, chart, diagram or graph, a decorative element, or a pictorial representation of a scene, person, animal, plant or object. As technology advanced, more visual elements entered communication scene: photography, cinema, radiophotos, facsimile impressions, television and finally satellite pictures, multimedia and Internet.

The encyclopaedic definition of photography (before the digital revolution) is that it is 'the science and art of producing permanent images on sensitized surfaces by means of the photochemical action of light or other forms of radiant energy'.

But today, photographs can be taken on digital cameras capturing images on magnetic disks or solid-state storage like flash cards, and these images are transferable on the Internet. The whole concept of photography has undergone a sea change since the 1990s. However, we should know some historical facts about the development of photography and photojournalism, as they are essential components of communication in the modern world.

Modern photography started with different kinds of cameras using a light-sensitive emulsion-coated thin material called film. The emulsion is spread in a thin layer over the material that is fixed on a supporting base. Most modem photographic film utilizes a flexible, transparent material

\footnotesize{\textsuperscript{3} Vijayan, K. (ed.), Ramayana in Palm Leaf Pictures (Citraramayana), Thiruvananthapuram: Oriental Research Institute and Manuscripts Library, University of Kerela), 1997, pp. 67-68.}
coated with a light-absorbent backing on one side and a light-sensitive emulsion on the other.

With this background information, let us look at the evolution of photography. The earliest type of camera was a box-like device called the camera obscura. It was in use in the 17th century. Light reflected from an external object passed through a slit or hole in the front section of the camera. An image of the object was caught inside the box on a ground glass screen or translucent paper at the back.

Experiments conducted late in the 18th century by Sir Humphry Davy and Thomas Wedgewood of England led to the capturing of photographic images on plates coated with photosensitive silver nitrate or other silver compounds. But these images were not permanent because the silver-coated paper blackened after exposure to light.4

By 1822, a French physicist, Joseph Nicephoirc, Niepce, produced a resist for etching of metal plates. This helped in obtaining a more permanent photograph. About 1831, a French painter, Louis J. Daguerre, made photographs on silver plates coated with silver iodide. After exposing the plate for several minutes, Daguerre used mercury vapour to develop a positive photographic image. But these photographs gradually darkened. Daguerre, therefore, used a strong sodium chloride solution. Using metallic plates, he could 'fix' the images more permanently. However, producing more than one single photograph for each exposure remained a major problem.

The British inventor, William Talbot, developed a method using a paper negative from which any number of prints could be made. Paper

coated with silver iodide was used, which was more sensitive to light if it was dampened before exposure. The same solution could be used as a developer for the exposed paper. After development, the negative image was made permanent by immersion in sodium thiosulphate (called 'hypo').

*Colour Photography and Eastman's Flexible Film*

In 1861, the British physicist James Clerk Maxwell succeeded in making the first colour image. However, it was in 1883 that real success came with the American George Eastman's production of a film consisting of a long paper strip coated with a sensitive emulsion. In 1889, Eastman produced the first transparent, flexible film in the form of ribbons of cellulose nitrate. This was the beginning of roll film and it marked the end of the early photographic era.

With the availability of roll film, thousands of amateur photographer came onto the scene, with suitable portable cameras. Photography became a much easier process by the beginning of the 20th century. Meanwhile, attempts had been made by many French and American photographers and inventors to give photographs the illusion of motion. In 1891, Thomas Alva Edison, the American inventor, patented the kinetoscope, a machine for projecting moving pictures; he had first demonstrated this machine in 1889.

In 1895, the French chemist and industrialist Louis J. Lumiere and his brother Auguste N. Lumiere, also a chemist, patented their

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cinematographe, through which they projected moving pictures. In the 1920s, sound was added to the motion picture. Early in the 20th century, commercial photography grew rapidly and became simplified for popular use. In the 1960s, zoom lenses became popular. With a zoom lens there is no need to use interchangeable lenses with different focal lengths. In the early years, artists and painters turned into photographers. Generally, their work reflected the characteristics of art, painting and drawing. In more recent times, photography depends almost wholly on the timing, shutter speed, camera quality, lens sensitivity and such other technical matters which play a very significant role, along with the photographer's own split-second decisions and reactions. More than art photographers and portrait photographers, it is photojournalists who have made photography a vital aspect of journalism.

Photojournalism

There is an old saying that a picture is worth a thousand words. Many facts that cannot be described fully in words, many objects that are beyond words, can be presented with the help of pictures. Photographs add authenticity and realism to descriptions. Journalism supported by photographs, and photographs that can tell a story, are both essential ingredients of photojournalism.

Outstanding documentary photographers of the 19th century who can be called pioneers of photojournalism include Roger Fenton, an Englishman who took photographs of the Crimean War in 1855, and Mathew Brady and Alexander Gardner who documented the American Civil War nearly seven years later. Their work is the best record of those wars. Brady's work, consisting of about 3,500 pictures of war scenes, helped contemporary and later historians who worked on the history of one
of the most important periods in American history.7

Photojournalism is now an essential part of journalism. Every newspaper and magazine employs a team of photographers; the size of this team depends on the size of the establishment and the circulation and reach of its publications. Some publications employ full-time photographers while others hire part-timers or freelancers. Photography plays an important role in modern systems of communication. Even on the Internet, we can transmit photographs and pictures to far-off destinations. What makes this possible is digitalization. We shall discuss the principle of digitalization later. But let us note here that digitalization helps not only in the transmission of pictures and photographs electronically but also in all computerized systems of communication, and that it is the very basis of information technology (IT). What is important for us here is that the digital pictures have very special qualities. Pictures for television or film are handled using electronic circuits to analyse them into electronic signals. Computer programming will help deal with the numbers, but it is expensive to formulate electronic circuits for each need. There are fast electronic computer programmes that help achieve picture analysis of the desired quality within seconds using simple calculations. The pictures that are stored in the form of numbers are thus given more effectiveness and clarity. Such image enhancement is being used not only for special effects in film or TV production but also for improving the clarity of satellite pictures sent from space or pictures of surgical procedures sent through terrestrial/space transmission mechanisms.8

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Using different computer techniques, pictures and certain desired portions of pictures can be enlarged and clarified. Through 'mosaic' technique, the faces of persons interviewed for television investigative reports who desire anonymity can be hidden, but their voices can still be heard, so that the viewers do not lose faith in the credibility of the persons thus presented.

Digital pictures are used most in news media. Events are photographed using digital cameras and transmitted to television channels for instant retransmission to the audiences. Such transmissions are done in newspapers too, especially for instant page transmissions to different editions. Digital cameras take pictures using charge-coupled devices (CCDs) that are highly photosensitive. Attached to the CCDs area microprocessor, memory devices and an energy source. This equipment will electronically convert the light that enters the camera into numbers stored in the camera's memory or on a floppy or a hard disc. The pictures thus stored temporarily can be modified, enhanced or decorated, using a computer suitably programmed for the purpose.⁹

A thumb-size CCD has the capacity to detect or identify about 4,000 grey levels. Scientists, particularly space scientists, have made the maximum use of this capacity to record pictures of distant comets, planets and even galaxies digitally. Digital cameras are used on a continuous basis to track the course of artificial satellites and probes sent to distant planets such as Jupiter. They are also being used to detect from orbiting satellites those areas of the Earth where natural resources are available. Such explorations are useful in the study of weather and climate changes in different parts of the globe and in predicting earthquakes, floods and other natural calamities. We mention all this to stress the large-scale application

⁹ Ibid.
of computerized visual communication which is what modern photography means.10

None of this progress took place overnight. The development of science and technology, electronic and digital devices, satellite technology, rapid telecommunication and computer operations, etc., have led to modern photography and visual communication. In this march of science and technology, some milestones are:

- The successful transmission by wire of pictures of the San Francisco earthquake in 1907, which inaugurated the era of wire photos and radio photos.
- The development of new cameras such as the speedographic press camera in 1912.
- The advent of 35 mm Leica, Rolleiflex, Konica, Yashica and Canon cameras, which helped in the worldwide expansion of photojournalism.
- The advent of colour photography and its expansion on a commercial scale following the Eastman Kodak Company's launch of their Kodachrome colour film in 1935 (Eastman enabled the common man to buy color film at affordable prices).
- The advent of the American technicolour in 1935 which led to the production of colour movies such as *Gone With the Wind* (1939)' and other films at MGM, Universal, Paramount and other studios.
- The arrival of the Edwin H. Land Polaroid camera in 1947, which eliminated messy developing liquids, inconvenient darkrooms, dryers, etc., and reduced exposure time from 60 seconds to 10 seconds in 1950. From 1963 onwards, Land cameras became useful in taking fully de-

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developed colour pictures within a minute.

- The entry into widespread use of the magnetic videotape invented in 1953, a major landmark in the visual communication field.\(^\text{11}\)

**The Magnetic Video Tape (MVT)**

The MVT could record a movie even as the film was playing either on the Video Tape Recorder (VTR), also called Video Cassette Recorder (VCR) coupled with the TV system or on the large silver screen. The MVT electronic process was started in 1953, and during the next five decades (and perhaps in the early decades of the new millennium) continued to be used for shooting both serial and feature films. The big advantage is that after every hour or so, the filmed tape can be replayed and mistakes caught before further shooting. This helps the producer/director to save on film footage, time and the tedium of re-shooting the whole scene or film. A highly useful device, MVT was developed with the active participation and encouragement of a great communications expert, David Sarnoff of the US, who started his career as a Marconi wireless operator and eventually rose to preside over both the Radio Corporation of America (RCA) and its national radio-television network, the National Broadcasting Company (NBC). Sarnoff was president of until 1970.

Photography was introduced to India in the mid-19th century. Currently, media have first-rate photographers and photojournalists in all the metropolitan cities and in media production centres in the state capitals. Professional portrait studios are available in almost all towns, big and small. Most photographers have switched to the latest techniques and equipment. Even in the district towns of small states, there are now digital studios. The

\(^{11}\) Ibid.
rapidity with which digitalization has spread in India is amazing. Before we move on to the more important visual media of communication, namely, film and television, let us dwell briefly on the phenomenon of digitalization (also referred to as digitization) which has become the most important common element in all modern media.12

**Digitalization**

Being digital and electronic—that is the most outstanding characteristic of all modern media. Information can be gathered, processed, stored, retrieved and transmitted digitally. Every piece of information can be translated into a '1, 0 'or 'yes, no' binary system. The word digital comes from the Latin root *digitus* which means 'finger'.

Theodore Mommsen, German historian and archaeologist, was struck by the visual similarity and significance of the lower Roman numerals such as I, II, III, IV, V, etc. (which represent 1, 2, 3, 4, 5, etc., of the Indo-Arabic system) to early counting using the fingers (digits). Two Vs (one V on an inverted V) gave X or ten, now written 10 after the concepts of zero and place value of 'O' were introduced by Indian mathematicians of yore.13

**The Binary System**

In addition to the digital system based on 10 and the vigesimal system based on 20 (10 digits and 10 toes) followed by the Eskimos, Native Americans and some African tribes, there is the binary system, which is

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12 Carlson, R. and B., Goldman, Fast Forward: Where Technology, Demographics and History will take America and the World Next Thirty Years, op. cit., p. 45.

13 Jacker, C., Man, Memory and Machine: An Introduction to Cybernetics (New YorK Dell Publishing), 1964, p. 31.
the basis of the modern computerized systems of communication, including telecommunications. In this system, all five fingers of one hand are taken as one unit. The system has a base of two and it is physiologically logical: we have two hands, two feet, two eyes and two ears. Some Australian aborigines, African tribes, and the earliest inhabitants of South America used to count this way.

Blaise Pascal built the first known calculating machine in France in 1642, basically an adding and subtracting machine. The great German mathematician-philosopher Gottfried Wilhelm Leibnitz designed a calculating machine that could also multiply, divide and extract the roots of numbers, and demonstrated it before the Academy of Paris and the Royal Society of London. He actually improved upon Pascal's calculator.14

Leibnitz was also interested in the transmission of information, but what is more important for us here is that he considered the binary system (that is, the two-element system, the very basis of all electronic computers) as quite useful for computing. As a philosopher, he considered the number '1' as representing God, and '0' as representing nothingness or the void out of which the entire universe was created. Through the great contributions of scientists of the 19th century and the production and process improvements achieved during the Industrial Revolution, which reached its peak during the closing decades of the same century, much of the electrophysiological and electronic basis of intrapersonal and interpersonal communication, including mechanical and electronic counting, was established. The foundations of radio broadcasting were also hid during

the closing decades of the century.¹⁵

A chronology of digital system application and its use in computers, after trying it in calculators, is given here to get a clearer picture of advanced systems of computerized communication (compunication) including digital photographic communication.

Briefly, Pascal's desktop calculator was improved upon by Leibnitz in 1673 and Galvani published a report of his research activities in electrophysiology in 1791. Jacquard introduced his punched card system in 1801 to control the production of fabric patterns. Within a decade and a half, Magendi introduced the concept of 'feedback and control' in the animal system. In 1833, Babbage abandoned the Difference Engine he had been working on for a decade and concentrated his attention on the Analytical Engine. In 1848 Helmholtz measured the speed at which a frog's nerve impulses were transmitted. In 1854, Boole published An Investigation of the Laws of Thought and initiated what later came to be called Boolean logic for binary systems operations. In 1868, Maxwell published his famous paper, The 'Theory of Governors', which discussed control mechanisms, the basis of cybernetics. The word has come from the Greek word kybernetes, meaning the person who steers or governs the boat.

The American mathematician Norbert Wiener who wrote Cybernetic Or Control and Communication in the Animals and Machine in 1948 is called the 'father of cybernetics'. Two MIT professors, Claude Shannon and Warren Weaver, had already worked out a mathematical model of information. They published A Mathematical Theory of

¹⁵ Ibid., pp. 56-60.
ENIAC (Electronic Numerical Integrator and Computer), developed by Professors J.W. Mauchly and J.P. Eckert, Jr., was the first electronic digital computer. It was put into operation in 1944 at the University of Pennsylvania.

In the latter half of the 20th century, rapid strides were made in the miniaturization of computers and the development of advanced programming techniques. The biggest development was electronic mail and the Internet, two technological marvels that can be considered the basis of today to globalization of communication and commerce, including the multinational transfer of photographs, pictures, graphics and data of all kinds. As mentioned previously, the digits in computer and digital technology are confined to 1 and 0. The binary digit is called, in the language of electronics and computer science, a bit. Scientists refer to 'bits' of information, that is, the number of pieces of information that the computer stores in yes-no, 1, 0 or on-off fashion. Eight bits form a byte.

All photographs and pictures can be analysed into bits of different intensity—light, very light, dark, very dark, etc.—by a computer. The colour and intensity of each dot are put into numbers. Each number becomes a digital symbol. We call a picture analysed this way a digital picture.\(^{17}\)

The following is equipment for digitalizing a picture for a computer: digital camera, charge-coupled device (CCD) camera, scanner, digitizer,

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\(^{16}\) Shannon, Claude and Warren Weaver, A Mathematical Theory of Communications (Urbana, IL: University of Illinois Press), 1949

\(^{17}\) Headrick, D., The Tools of Empire: Technology and European Imperialism in the 19th Century, op. cit., p. 87.
and so on. The scanner is used very frequently in the publishing industry. It works like a copying machine attached to a computer, converting each picture into a series of numbers. The analysed or scanned picture can be displayed on a computer screen or copied through a laser printer. If necessary, the characteristics of the picture can be altered using appropriate computer programmes. The scanned picture is a template of a series of Os and Is in a certain order. Instead of 0 and 1, different colour gradations can be the basis of scanning: black, deep black, light grey, grey, white, etc. This will yield a more realistic symbolization and each symbol is a pixel (picture element).  

**Film: the Most Powerful Audiovisual Medium**

If photography paved the footpath to the world of visual communication, film built the macadamized road and television and the new media constructed the 12-lane highway to audiovisual communication. The progression from still photography to moving pictures was natural. Attempts to make pictures move were taking place in many parts of the world during the latter half of the 19th century. There is no single inventor of film; several inventors were working in the US, UK and France almost at the same time, unbeknownst to one another, and all of them were photographers of one kind or another.

Six eminent inventors contributed to the development of the movie camera and the projector: William K.L. Dickson and Thomas Alva Edison (both from the US), who worked together; Etienne Jules Marey (France) and Eadweard Muybridge (US), who tried to capture photographs of fast-

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moving animals and machines; and the Lumiere brothers, Auguste and Louis, who were the sons of an industrialist and photographic plate manufacturer, Antoine Lumiere, of Lyons, France.

Edison, who is also credited with the invention of the light bulb and the phonograph (gramophone), together with his assistant William Dickson developed the kinetograph, a movie camera, in 1891, in his laboratory in West Orange, New Jersey. Edison also succeeded in patenting the kinetoscope, a crude form of motion picture projector, in 1893. The kinetoscope arrived in Paris in 1894 but it was mainly a viewing machine rather than a screen projector.

Meanwhile, the Lumiere brothers, who had expanded their father's factory in Lyons into a 3-million-franc company with 300 workers making 15 million photographic plates a year, succeeded in developing a machine for the projection of films. On 13 February 1895, they patented a camera for filming and viewing chronophotographic proofs which could project films in addition to recording and developing them. They also started to make their first film, La sortie des urines Lumiere (Leaving the Lumiere Factory), using the camera they had patented. This minute-and-a-half-long movie depicted workers coming out of the factory during their lunch break. The film was exhibited before an audience of about 200 scientists interested in film and photography on 22 March 1895.²⁰ Despite the suggestions and recommendations of many friends and well-wishers including their father, the Lumiere brothers named their invention the cinematograph. It is from this word that we get cinema, for moving pictures.

According to the Chronicle of the Cinema, the first Lumiere

production was exhibited after Louis Lumiere presented his lecture, 'The Photography Industry', to a gathering at the National Society for Industrial Advancement at a hall on the Rue de Rennes in Paris. The 'dumbfounded' audience saw on the screen the still factory building coming alive in a second and workers walking out of the factory.\(^{21}\) Though the film lasted for only one and a half minutes, crowds gathered in large numbers at shows organized in other parts of Paris and in other cities. The Lumiere brothers shot and exhibited other short films such as 'Arrivee d'un train a la Ciotat (The Arrival of a Train at la Ciotat). People could not understand how objects could be shown as moving. 'It was an astonishing vision of reality—of life caught in full swing.' Those animated pictures would certainly have made the members of the audience wonder if they were hallucinating!

\textit{Cinema in India}

Cinema was shown for the first time in India by the Lumiere brothers on 17 July 1896 at Watson's Hotel in Mumbai, six months after their public exhibition of moving images in Paris. But cinema developed in India in an entirely different manner. Since the equipment for shooting movies and projecting them were already available because of the efforts of talented inventors in the West, movie-making in India was comparatively easy, although there was a great deal of teething trouble. In the early years of India's movie history, the country was under colonial rule. Colonialism puts fetters on creativity; yet, as Robert Sklar has observed in his voluminous work, \textit{A World History of Film}, 'India, though a colony of Britain until after World War II, became the third largest film producing country (behind the US and Japan) and laid the groundwork for

later decades." How did this come about, especially since up until the late 1920s, as in many other lands, Indian theatres screened mostly Hollywood films?²²

Before the advent of moving pictures, people's imagination had led to the production of moving images through magic lantern and puppet shows. Inventors in the Netherlands in the mid-17th century used sunlight during the day and candlelight at night to project images painted on a reflective surface through a lens onto a whitewashed wall—that was essentially the technique used in pre-magic lantern projections. The next stage was the development of a projector carrying a light source within itself and a lens. This looked like a lantern with the power to project images on the wall and hence called 'magic lantern'.²³

Magic lantern shows were a combination of shadow plays and still pictures, enhanced with narratives and dialogues as well as running commentaries provided by skilled narrators behind the screen. Puppet shows, moving images on lighted screens and shadow plays were prevalent in many Asian countries including Indonesia, Thailand and India. Country fairs in several countries made good use of magic lantern shows to entertain the populace.

Multimedia screen entertainment began long before movies became a significant part of popular culture. In our audiovisual age, we are likely to miss the historical importance of magic lantern shows, although it remains a fact that they existed for almost two centuries. Even after the advent of regular movies, magic lantern shows continued in the initial years of the audiovisual age. The role of the magic lantern shows where

²³ Ibid.
scenes of skeletons, lifelike moving ghosts and other figures in the form and style of Fantasolagonrie (Phantasmagoria) were staged by a Belgian named Etienne Gaspar Robert is significant in the themes of some early movies. The early 19th century magic lantern shows utilized contemporary science to make the shows more realistic. Following the big success of their first film, the Lumiere brothers shot at least half a dozen movies in 1896 and another dozen that have survived in the following years up to 1907. Sklar observes that the Lumieres were constructing ‘a basic mise-en-scene of the totality of the film's visual style: placement and movement of camera and performers, decor, lighting—all that appears before the camera’

In 1912, two enterprising people from Bombay Province, R.G. Torney and N.G. Chitre, made a short documentary, Pundalik, based on the life of a Maharashtrian saint by that name. Although this was the first movie made in India, the credit for laying the foundation for the Indian movie industry goes to Dhandiraj Govind Phalke, who made the first feature film, *Raja Harishchandra*, in 1913. It was based on the Mahabharata story of King Harishchandra, a righteous ruler whose devotion to God was tested. Like Job in the Bible, this king underwent all kinds of adversities including the sacrifice of his family and being forced to take up the menial job of disposing of dead bodies, including that of his own son.

Whereas in Europe and the US no single individual is honoured as the 'father' of Phalke is honoured as the father of Indian cinema and the highest film award in India is known as the Dadasaheb Phalke Award. It is given annually to the best film personality, whether it be the best director, playback singer, producer, music director, composer, 

\[24 \text{Ibid., p.34.}\]
cinematographer, actor or actress of long standing who has contributed significantly to the art and science of Indian cinema.

It is ironic that many cineastes of the United States and Europe objected to sound films or talkies in the late 1920s. Their contention was that sound spoiled the artistic quality of the moving pictures. Movies had their own universal language, so to speak. An Italian could enjoy an Indian movie as much as an Indian could enjoy an Italian movie, so long as the two movies were silent. Once actors and actresses had dialogues that could be heard, the audience could follow them only if they spoke the same language. This was especially applicable to Indian movies. India, China and the Soviet Union (in the early years of its existence) each had several languages, so the silent movies were popular. When spoken language became a vital ingredient of movies, people could no longer as easily follow the cinematic language that can be universally recognized without verbal dialogue.²⁵

There was another objection to sound films which we can understand better when we look at film not as an art but as business. Producers objected to sound film because it would cost them most of their earnings from the foreign exhibition of silent films. The foreign film market was of considerable significance in the economics of American and French film production even in those days. Dubbing in foreign languages, however, was still 'an unsure and very expensive process'.²⁶ The synchroscope, cinematophone and cameraphone were used for dubbing, but they did not perform well, which was another reason for producers to object to sound films.

Whatever the merit of silent movies, they are no longer acceptable to audiences around the world. In a way, the existence of 15 major linguistic regions in India became a vital reason for the sudden growth of film in India because there arose 15 different varieties of movies, those in Hindi accessible to almost 45 per cent of the population, and the ones in prominent languages such as Bengali, Tamil, Telugu, Malayalam, Kannada, Marathi, Gujarati and Assamese accessible to regional markets. Prominence here is measured in terms of the number of movies produced in each language. Connected with the movie industry were and are large numbers of artistes from different regions—musicians, lyricists, playback singers and others.

There are also certain uniting factors. Hindi movies have had great appeal from the late 1930s onwards throughout India, because of the concentration of Hindi-speaking people in the metropolitan cities and large towns where most of the cinema houses have always existed. Almost all Indian movies leave more or less the same pattern, with an emphasis on lyrics, plenty of dialogue and dance numbers enjoyed by people in all linguistic regions. No wonder the number of movies made in India increased so rapidly. Today, India has the distinction of producing more movies annually than any other country in the whole world.27

*The Bombay Talkies*

The establishment of the Bombay Talkies by Himansu Rai and Devika Rani in the 1940s greatly promoted the film industry. The two were not only eminent cinema and stage artistes but also good organizers. Hailing from a prominent family in Bengal, Rai went to England to study law. His meeting there with Devika Rani, a niece of Rabindranath

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Tagore who was studying architecture in London at that time, lessened his interest in law although it heightened both individuals' intense interest in acting and the arts; that shared interest brought them together in several theatrical productions. After attaining technical proficiency in acting, stage management, cinema production and allied fields, they returned to India, got married in 1933, and started working on the establishment of a full-fledged film studio. Thus came into existence the Bombay Talkies which produced a series of important films and an impressive list of actors and actresses. Ashok Kumar and Dilip Kumar, who became giant actors later, were proteges of the Bombay Talkies, Devika Rani was the first recipient of the Dadasaheb Phalke Award when the Award was instituted in 1969. Ashok Kumar won it in 1988 and Dilip Kumar in 1994.

Coming back to the advent of sound films, the first talkie was Warner Brothers' Don Juan (1926), although it was not a feature-length movie and the actors did not talk. According to Bruccoli et al., the only sound was a synchronized musical score and sound effects.

But the first real talkie in the US was The Jazz Singer, a musical in which Al Jolson, a singer, was the hero. It was first screened on 6 October 1927 at Warners' Theatre in New York's Times Square. As Al Jolson played the piano and sang in the movie; he uttered the words 'Wait a minute, wait a minute, you ain't heard nothing yet', and these are considered to be the first words ever spoken that became part of synchronous speech in a feature film. The sound system which the Warner Brothers used was the Vitaphone, invented by Hugh M. Stoller.

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29 Sklar, R., A World History of Film, op. cit., p. 168
and Harry Pfannenstiel of AT&T Bell Labs, and utilized by the Warners in their Hollywood production, The Jazz Singer, in 1927.

According to Sklar, there were earlier sound productions, but they were 'inhibited by stationary microphones, constraining performers' movement, and an immobile camera, enclosed in a large sound-tight box so microphones would not pick up the noise of camera motors.\textsuperscript{30} The first talkie in India was Ardeshir Irani's Alam Ara; it came out in 1931. Film directors in India found that despite the multiplicity of languages, there were certain common elements that appealed to audiences in different linguistic regions, such as religious themes based on the two great epics, the Mahabharata and the Ramayana, and on folk tales and legends. The three systems of music (Carnatic, Hindustani and folk music) appealed to English-educated, traditionally educated and illiterate village people in all regions of India.

Indian film themes, music and style of presentation are totally different from those of the West; in fact, there are basic sociological differences between Eastern and Western films. For example, the expression of love, a basic instinct in all cultures, is totally different. Intimate, sexual scenes are not encouraged in Eastern movies, which does not mean that sexuality is different in different cultures, but that filmic or stage portrayal of the man-woman relationship differs according to social norms prevalent in each region of the world. Public expression of sexual love or open display of affection in public places is rarely seen in real life in Eastern countries.

According to Sklar, the realism of the early movies in the West had severe limitations as they were in black and white, whereas the real

\textsuperscript{30} Ibid., p. 171.
world is one of colour. They were silent, whereas the real world is full of sounds—and noise, if you will. (We should not, however, ignore the fact that most silent movies were accompanied by music, dance and other improvisations.) Films did not stand alone, they were exhibited with other shows in the same theatres either before or after the movie shows. However, the camera had a special advantage: several copies could be made of a single film and exhibited simultaneously in different places. This was one great reason for movies growing into a major mass medium. This is why movies were shown in different parts of Europe and in India in the very year that the earliest movies were shown in France and the US. By 1901, movies were screened in many areas of Asia, Australia and Africa (Egypt, for example). No wonder film became a global medium so soon.31

Another important landmark in film history is the arrival of colour, following the introduction of photographic colour film by Eastman Kodak. One of the earliest colour movies in the US was Gone with the Wind (1939) starring Clark Gable and Vivian Leigh. Colour movies became common in India in the late 1950s. Today, new black and white movies are a rarity in most part of the world.

There were many startling developments in other media, such as linotype machines and rotary presses that speeded up the production of newspapers, Although at the turn of the century the main media were printed newspapers and books, there was a very rapid shift thereafter to films, radio and television. By the middle of the 20th century, the media on the whole were audiovisual. With the advent of computerization in the media, all media can now be called audiovisual, because even newspapers on the Internet can easily be converted into audiovisual

31 Ibid., p. 412.
Radio, movies, recorded music, television, video, computers, CDs, DVDs and various other media and formats of communication are audiovisual. We will look into this further when we discuss the new media of the 21st century. Before that, let us have a quick look at the evolution of radio broadcasting and its emergence as a mass medium in the early part of the 20th century.32

Radio: The First Real Electronic Media.

After the telegraph, the telephone and the film, the most significant development in the field of communication was the radio. In 1873, British physicist James Clerk Maxwell said that messages could be transmitted without the use of wires. There had been some protests in big cities of the West against the indiscriminate wiring of buildings as it detracted from the beauty of the architecture. A reason for this protest may have been that the telephone was still an instrument of business and not a personal device for long-distance communication.33

For this or other reasons, scientists were experimenting with wireless systems for sending messages, taking inspiration from Maxwell's theory of electromagnetic radiation. Maxwell theorized that electromagnetic waves existed and that their radiant energy could be harnessed for sending messages at the speed of light over long distances. In 1888, Heinrich Hertz of Germany provided support to Maxwell's theory through the actual creation of electromagnetic waves in his laboratory. He

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32 Broccoli, M. V. Tompkins and et al. (eds.), American Decades 1900-1909, op. cit.
measured their wavelength and confirmed that they travelled at the speed of light.

Jagdish Chandra Bose of India conducted experiments on electric waves based on the theory of Maxwell. Independent of Hertz, he obtained waves of short length (5mm) using his own device, the 'Electric Radiator'. In 1885, he succeeded in sending wireless signals, but did not pursue the matter further as he was more interested in the growth of plants, which is measured by the crescograph.

It was Guglielmo Marconi of Italy, a young inventor, who put Hertzian and Maxwellian findings to practical use. First he sent wireless telegraphic messages from his upper room to the kitchen in his house. Continued experiments showed that he could send wireless messages to points 9 miles away. He had a practical business sense, although he was still young. At the age of 23, he established the Marconi Wireless Telegraph Company with the help of some financiers in England, where he had migrated with his Irish mother. Marconi's company started sending wireless coded messages (using Morse code) across the English Channel. Within three years, in 1901, the company succeeded in sending three dots (the Morse code designation for the letter S) across the Atlantic from the English coast to Newfoundland.\(^{34}\)

Marconi's invention was found most useful by shipping companies and other businesses, which could exchange business reports and data, arrival and departure details of ships, for instance, with unprecedented speed. This brought further success for Marconi. During a visit to the US, he set up an American subsidiary of his company. In less than 15 years, the young entrepreneur had established his monopoly over wireless

\(^{34}\) Ibid.
Then Marconi found an unusual use for his wireless. The *New York Herald* started using Marconigram (the telegram) for news dissemination. Gradually, hundreds of newspapers came to depend on wirelessly transmitted news. When news agencies came into being, dependence on wireless news and radio photographs increased severalfold.

The four scientists who effectively made radio a magic medium for carrying human voice across the globe were Reginald Fessenden, Karl Braun, Lee De Forest and Edwin Armstrong. Fessenden sent out the first radio signals that carried human voice and music to a ship at sea. The crew, which was used to hearing mere Morse code beep signals over the wireless were intrigued by the human voice and Handel's music. At least some of them thought that it was the voice of sea nymphs or some supernatural creatures such as the sirens of Greek mythology! This happened on 24 December 1906 and it was the first step towards radio broadcasting.

Meanwhile, the German physicist Karl Braun, who was working on radio receivers (in those days they were called *crystals*) that used the energy in radio waves for power, succeeded in adapting *diodes* for radio use in 1900. Until this time, crystal radio sets had not had loudspeakers, so only one or two people could listen to the radio at a time. However, the use of diodes was a major step in the development of the radio. For their work, Braun and Marconi shared a Nobel prize in 1909.

Diodes are electronic vacuum tubes with two electrodes. They were...
used in radio receivers to change alternating current (AC) to direct current (DC). *Triodes* are three-electrode electronic vacuum tubes that strengthen weak electrical signals in order to control much larger electrical currents.

The credit for inventing the *triode valve* goes to Lee De Forest, who is considered the father of modem radio broadcasting. His ‘audion’ was costlier but more efficient than the crystal detector. With the audion commercial broadcasting became easier, as it amplified radio signals several hundred times, which was necessary to broadcast (like the seeds in a farm) signals over a very wide range.\(^3^6\)

Lee De Forest took his invention to Paris in 1909 and transmitted voice from the top of the Eiffel Tower to receivers up to 500 miles away. The terms *radio telephony* and *radio telegraphy* gave way to *radio*, mainly because of him. Incidentally, De Forest had developed a sound system called *phonofhra* for converting silent films into sound films, but Hollywood was not interested. He was such a brilliant inventor that producers in Sweden used his process in 1924 to make a talking picture called *Retribution* which was thus the first talkie, according to Vincent Tompkins.\(^3^7\) Edwin Armstrong through his invention, the super heterodyne *circuit*, succeeded in introducing a system by which listeners could tune into different broadcasts very easily. Two names stand out in the annals of the rapid development of commercial broadcasting in the US (which is today the media Mecca of the world; with more than 10,000 radio stations and 12,000 television stations): David Sarnoff and Frank Conrad.

David Samoff started life as a wireless operator in Marconi Wireless Company and rose to the position of President of the Radio Corporation of

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36 Chatterjee, P. C., Broadcasting in India, op. cit., p. 120.
37 Broccoli, M. V. Tompkins and et al. (eds.), American Decades 1900-1909, op. cit., p. 200.
America (RCA). While working in the Marconi Company, he wrote a memo to his superiors pointing out the possibility of reaching radio programmes to individual homes. His ideas and his recommendations were ignored by his superiors. However, when he became the Commercial Manager of the RCA, he was finally in a position to implement his ideas.

Sarnoff was also a pioneer in the use of magnetic video tape for film and television recording. The development and widespread use of the video cassette recorder (VCR) in film and television production and among media users owe much to him.38

Dr Frank Conrad was an engineer in the Westinghouse Electric Company before he took charge of the KDKA radio station in Pittsburgh, an industrial town in Pennsylvania, on 2 November 1920. At KDKA he pioneered commercial radio broadcasting, heading perhaps the first commercial broadcasting station in the world.

In those early days, news was the staple of broadcasting, but the interesting fact is that the radio stations depended on the newspapers for news, whereas today the opposite is true. Soon the stations found that people were equally or perhaps more interested in sports, music and other programming. Today there are 24-hour stations devoted to news. There are all-music stations, within which are stations devoted to different branches of music—rap, classical, rock and blues. But music radio stations have yielded to Music Television (MTV) these days. Even the radio broadcasting of sports has been affected by the rise of television. People are more interested in the visual than in the audio medium, although audio cassettes and compact discs of music have captured the imagination

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of a large number of young listeners. Television has affected film and radio to some extent.

The development of miniaturization and transistorization by Japanese inventors and commercial promoters was a major event in the history of the radio. Big, unwieldy radio sets were replaced by portable sets which people could carry with them anywhere they went—on travel, during picnics, while jogging, etc. Today, there are dozens of varieties of these miniaturized entertainment instruments.39

Radio in India

Early forms of modern communication—the telegraph, telephone and wireless—were strictly under the control of the British government in India before 1947 and later even under the independent Government of India. What the British government did in the media world during pre-Independence days was continued by the new government. Radio was no exception.

All public communication except through newspapers was under the thumb of British authority. Even the newspapers were under surveillance, especially those that were nationalist and hence supportive of the Gandhian movement for independence. Media of public communication, including the telegraph, telephone and wireless, were monopolized by the British government. There were no independent entrepreneurs to support the research activities of Jagdish Chandra Bose, who had done some remarkable work in the creation of short electromagnetic waves in the laboratory, and turn them to public benefit.

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The telegraph was used as an aid to the Indian railways, which were introduced by the British in the mid-19th century for the express purpose of moving troops and provisions to far-off stations where there were rumblings from disgruntled native princes who were uniting against the British suzerainty, though belatedly. The telephone was a luxury enjoyed by the British and Indian civil servants. There was no effort from any quarter for the democratization of communication, as the entire system was dominated by an alien government. 40 With Independence in 1947 matters were expected to improve, but there were tremendous problems for the new government and the infrastructure for modern communication remained undeveloped until the 1980s, when rural telephone expansion took place in a major way.

To continue with the story of radio's development in India, broadcasting started in 1927 under the auspices of the Indian Broadcasting Company, Bombay, with transmitters in both Bombay and Calcutta. But the company could not continue operations, despite the government's political support, because of severe financial constraints. However, some 10,000 people, all elite citizens of the four metropolises, had already bought radio sets, and their political and economic clout resulted in a revival of broadcasting (there were no radio set manufacturers in India at that time; all sets were imported, and licence fees were collected from set owners). The name of the new company was the Indian Broadcasting Service and it was started in 1930 as part of the Information Wing of the British Government of India.41

Whereas in other parts of the world various types of economic and

40 Ibid.
technical changes in society led to corresponding changes in the world of broadcasting, no such changes occurred in India. For example, an electronic media culture had developed in the US and UK during the 1920s, which resulted in major changes in the operation of the radio medium. The print media had reached a higher technological status with the sophistication bestowed on them by radio photos, teleprinter (teletype) machines, faster rotary presses, better photograph reproduction in print, more efficient distribution systems, and so on. The early decades of the 20th century thus saw major developments in printing and publishing. Speed in telecommunication was universally recognized among most sections of the people as an essential aspect of life because of the spread of literacy and education among the large majority of the Western population.

As we have seen, there was initially no great competition for print media from the new medium of radio because, for the most part, radio broadcasters depended on the newspapers for news. Soon things changed. People found the radio more engaging and fresh throughout the day and night because the radio stations in the West were under private ownership unlike in India where, until recently, the broadcast media were wholly under the control of the government; and private entrepreneurs did not have to depend on government or wait for bureaucratic sanction to introduce novelty in timing or content. There were some restrictions on the frequency, timing and content of the broadcast media in the US until President Reagan's time, when most restrictions were removed, except those relating to technical matters.42

But the most important factor in the development of the radio was the introduction of commercials, a technical term for advertising on radio

and television. The newspaper companies were making profits or breaking even not from subscriptions but from advertisements. Those who were running radio stations learnt this lesson from newspaper publishers—some of whom happened to be radio station owners too. Thus, from a very early period, radio turned commercial in the West. It is generally recognized that the first radio commercial was heard in New York in August 1922—that is, less than two years after KDKA pioneered commercial broadcasting in Pittsburgh. It was a commercial for an apartment building, and the advertiser, it seems, paid $100 to the radio station for network time. It is also believed that by the beginning of the 1930s, advertisers were spending almost $25 million on radio commercials.

Commercial advertising on the radio in India started in 1967, although many media experts and others had suggested introducing it much earlier, because they maintained that for the successful functioning of radio, turning commercial was essential. The decision-makers in the Information and Broadcasting (I&B) Ministry, under whom radio functioned, would not change their policy until they saw that Radio Ceylon was capturing the interest and imagination of the Indian listeners. Thousands of radio listeners in all parts of India had by then become ardent votaries of the attractive entertainment and music programmes from India's neighbour, which had already carved special niches in their radio programming specially for Indian listeners. Indian advertisers were buying commercial time on Radio Ceylon for Indian products and services. This opened the eyes of the I&B Ministry and radio turned commercial in India from 1967.\(^43\)

In 1947, India had 11 radio stations—six under the central

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government and five in the princely states. The rulers of Mysore and Hyderabad had started broadcasting stations in 1935 and 1939, respectively. Later on, when All India Radio (AIR) was formed, these two stations were taken over by it. Delhi, Madras and Lucknow also had radio stations before 1947.

In 1936, Lionel Fielden of the British Broadcasting Corporation (BBC) was brought to India to streamline the operations of AIR, which had come under the direct supervision of I&B Ministry. The Indian terms used for 'broadcasting', such as akashvaani (Sanskrit and Hindi and therefore familiar to most linguistic regions), vaartoli (mainly Tamil), and vaani (Telugu) are also used when referring to AIR, in different regions of India. It is said that the Mysore ruler suggested the use of akastivaard for radio in the 1930s and that name has stuck.44

By 1977, the number of radio stations in India had increased to 62, and the number of radio sets to 20 million. In 1982, there were 86 radio stations and 160 transmitters. Today, India has 118 regional centres or full-fledged stations and 82 district centres, for a total of 200 radio stations. There are plans to increase the number of stations, particularly frequency modulation (FM) stations in the metros and state capitals. The number of sets has increased to 200 million, which indicates that radio is the most popular medium in India.

The government-run broadcasting set up was called the Indian State Broadcasting Service (ISBS), Interestingly, ISBS was started under the Department of Industries and Labour. Fielden brought to All India Radio-a name thought up by him-"a veneer of respectability, a

little polish, some enterprise, a good deal of pride and prejudice, if not much sense and sensibility."45

How ISBS was changed into AIR in June 1936, is a fascinating tale told with relish by Fielden: “I had never liked the title ISBS which to me appeared not only unwieldy, but also tainted with officialdom. After a good deal of cogitation—which may seem ridiculous, now, these apparently simple and obvious things do not always appear easily. I had concluded that All India Radio would give me not only safety from the clauses which I most afraid in the 1935 Act, but would also have the suitable initials AIR. I worked out a monogram which placed these letters over the map of India. But, when I mooted this point I found that there was immense opposition in the Secretariat to any such change. They wanted ISBS and they thought it soper. I realized that I must employ a title unnatural tact. I concerned Lord Linlithglow after a Viceregal banquet and said plaintively that I was in a great problem and required his advice. I said, I was determine, that he agreed with me that ISBS was a fine title. After a slight pause, he nodded his long head wisely. Yes, it was rather a mouthful. I said that perhaps it was a pity to use the word broadcasting at all, since all Indians had to say 'broadcasting broad' was for them an unpronounceable word. But I could not, I said, think of another title; could he help me? 'Indian State', I said, was a term which, as he well known, hardly fitted into the 1935 Act. It should be something general. He rose beautifully to the bait. 'All India?' I expressed my astonishment and praised. But surely not 'broadcasting.' After some thought he advised 'radio!' Splendid, I said and what beautiful initials. The Viceroy concluded that he had invented it, and there was no more problem. His pet name must he adopted. Thus,

45 Ibid.
All India Radio was born.46

*The War Years:* The first daily news bulletin was started in 1936. But World War II necessitated the growth of a national network and an external service, and the installation of high power transmitters to expand coverage. Nazi propaganda was coming through loud and clear, and it required to be countered. Thus was setup the practice of all news bulletins being broadcast from one central newsroom. During the war years as many as many as bulletins were broadcast each day. Further, the External Services as also a Monitoring Service were started as part of the Military Intelligence Wing. These were delinked when the war ended, and All India Radio was transferred to the Department of Information and Broadcasting in 1946, and it remained with that Department/Ministry until September 1997 when the Prasar Bharati, an autonomous statutory body, was constituted under the Prasar Bharati Act (1990).

*Underground 'Congress' Radio:* The leaders of the 'Quit India' movement had no access to either radio or the press. All India Radio was British imperialism's propaganda instrument the papers were heavily censored. The only alternative was the establishment of underground radio, using a dismantled transmitter. A group of young Congress freedom fighters (Usha Nichta, Vithaldas Khakar, Chandrakant Jhaveri) began their short-lived Congress Radio on September 3, 1942 on 41.78 meters from somewhere in India' The broadcasts continued till November 11 of that year with a short break from October 15-17 to raise the transmitter's power. To escape detection the portable radio station was moved from place to place. However, the British police soon got wind of the underground broadcast centre. The police commissioner

46 Chatterjee, P. C., Broadcasting in India, op. cit.
reported that the chief of the group was 'responsible to Ram Manohar Lohia for the success of the scheme, and that he also received the required funds from the latter.' The young radio enthusiasts were soon arrested and put on trial. In the radio case trial, Khakar was held to be the 'arch conspirator' and charged with spreading disaffection and hampering the war effort; he was a five year prison term while the others were punished for a year each. Thus ended the nationalists' lone attempt to challenge the official All India Radio's version of the freedom struggle.47

Radio is affordable to a very large number of people, especially in the rural areas, because of the transistor revolution of the 1960s. Even regular sets are affordable to most people because of the low price. TV is definitely a more attractive medium, but it is not easily affordable to people in the rural areas. There is a direct link between people's prosperity and their media use.

Radio programming

Radio programming, and for that matter all media programming, depends on what the organizers of the media consider to be the interests and tastes of the listeners or the public. This is especially true of privately owned broadcasting systems, where the owners and operators make it a point to survey public opinion from time to time and decide on the changes required in programming so as to attract the maximum number of listeners or viewers, proportional to the amount of advertising they can canvass. Sometimes certain national priorities, as seen by the political and social leaders of a nation, may not be seen as priorities at all by media directors; this can lead to conflicts between government and private media.

47 Ibid., p. 112.
Broadcasting in India (both radio and television) has from the start been under the direct control of the government (British as well as Indian). In recent years, however, because of the liberalization, privatization and globalization trends in India, some changes have taken place in the media world. Since September 1997, both the broadcast media have been placed under an autonomous corporation, the Prasar Bharati Corporation (PBC) formed by an Act of Parliament. It is almost a decade since the PBC has been formed but many critics point out that there has not been any major change in programming. But to expect the media to help a country to achieve development without altering the basic socioeconomic structure of that country is too unrealistic. The United States has a highly developed media system; but to say that it was the media that helped the United States to reach a high stage of economic development is like putting the cart before the horse.

American broadcasting networks reorganized their programming according to the public taste, and even took up 'narrowcasting' instead of broadcasting for this purpose. It became clear that radio programmes should appeal to different sections of the public based on socio-demographic and psychographic characteristics. Thus developed all-news stations devoted solely to news, with commercial breaks; classical music stations; rock and roll stations; light and pop music stations; and so on this type of programming is being tried low in the FM stations of India. However, to attain the objective of reaching all section's of the listening public in India, there is a need for many more stations. This is an immediate task for the PBC but more private entrepreneurs are essential. There are some changes in the ownership pattern of radio in India, but complete privatization has certain disadvantages, as experienced in the
Radio's development in India has been totally different from its development in America. No private enterprise was allowed in Indian radio, and the government showed limited initiative. Research and development activities were unheard of and higher educational institutions were few. In short, radio did not have any scope for commercial growth in India. No wonder the growth in the number of stations was until recently extremely small and expansion quite slow. Programming remained confined to classical music and news for the most part. When we analyse AIR's programming pattern, we realize that nearly 40 per cent broadcast time is set apart for music and music-related programmes. In the initial years, music programmes broadcast on AIR were aimed at the learned audiences in royal palaces and *sangeet sabhas* (music concerts or music assemblies) but, from 1952 onwards, both Hindustani and Carnatic classical music was broadcast. As mentioned earlier, AIR turned commercial in 1967 and from then on film songs and light music were broadcast on AIR channels to win back the audience lost to Radio Ceylon. Western music is broadcast from stations located in metropolitan and large urban areas. Other than music, there are weekly dramas, adaptations of popular short stories and novels, talks aimed at youth, women or particular social groups, humorous skits and so on. A sizeable chunk of broadcast time is devoted to news every morning, noon and evening.49

On the eve of freed on AIR had yet to have a truly national network. With only six stations located at Delhi, Bombay, Calcutta, Madras, Lucknow and Tiruchirapalli, and four stations in the princely

states of Mysore, Travancore, Hyderabad and Aurangabad, a mere 18 transmitters, and the number of receiver sets at just 250,000 for a population exceeding 325 million, drastic steps were called for. They came in the form of 'pilot' stations and low power transmitters installed near them, in the States and linguistic areas which knew no broadcasting so far. Within a couple of years, 25 stations had set up functioning and the sales of sets picked tip in the cities and towns, but the prices were far above the means of the rural classes. The introduction of the commercial channel 'Vividh' in October 1957 further increased the interest and popularity of radio as a mass communication. Ten years later, commercials became an integral part of Vividh Bharati. Yuvavani or the Voice of Youth went on the air on July 23, 1969 in New Delhi; other cities followed suit in the major Indian languages.

In April 1976, Doordarshan was de-linked from All India Radio; this allowed radio in India to take off on its own instead of being looked upon as television's 'poor cousin.' FM services were introduced; local stations (Nagercoil station, for instance) and hourly news bulletins were introduced by the mid-eighties. By the early nineties, phone-in programmes in Delhi, Pune and other cities were experimented with. A landmark achievement was the begin of the Sky Radio Channel on April 1, 1994, which enabled subscribers to receive 20 radio channels via satellite on their FM receivers.

AIR's venture in 'radio paging' in 17 centres where it has FM transmitters has not been very successful because of the competition from private paging companies. All India Radio in the late 1990s: In the late 1990s, All India Radio comprised a country-wide network of 219 Centres including 32 Vividh Bharati/Commercial Centres, 73 local stations and 114 regional stations. An estimated 115 million
radio/transistor sets have reached to AIR programmes: over 65 million of these sets are in rural areas.⁵⁰

As one of the largest radio news organisations in the world, AIR puts out over 300 news bulletins every day on its national, regional and external services. Further, AIR’S ‘Home Service’ programmes are beamed from 242 transmitters over 90% of the geographical area and 97% of the population, thus catering to most of the nation and linguistic regions of the country. AIR's main sources of news, besides its 90 regular correspondents in India and seven abroad, and 246 part-time correspondents, include the two national news agencies, PTI and UNI, the Hindi news agencies, Univarta and Bhasha and ANI (Asia News International). AIR's Monitoring Units—which monitor most of the world's major broadcasting organisations' output – are also an invaluable source.⁵¹

*Frequency Modulation (FM) Broadcasting*

FM broadcasts were started in Madras in 1977 and later at Jalandhar in 1992, but it was only in 1993 when time slots came to be leased to private companies that FM became synonymous with pop music and youth culture. Coincidentally, the music video channels, [V] and MTV channels were begin around the same time on Star TV. FM broadcasts ensure reception free from atmospheric noise and electric interference. The AIR stations of Delhi, Mumbai, Bangalore, Chennai Panaji and Kolkata, now sell FM slots to private producers such as Times FM, Radio Midday, and Radiostar.

On August 15, 1993 a Frequency Modulation (FM) Channel was

⁵⁰ Chatteijee, P. C., Broadcasting in India, op. cit., pp. 45-50
⁵¹ Ibid., p. 57.
started in Bombay, with nine hours of radio time leased to private producers like Times FM, Radiostar and Radio Midday. All India Radio charges a fee of Rs. 3,000 per hour, but the private companies charge advertisers Rs. 250-300 for a ten-second commercial. The broadcasts in most of the cities are oriented to urban English-speaking youth, with western pop music dominating. Besides sponsored hit parades and countdowns, the FM programmes include chat shows, news bulletins, contests, quizzes and plays. Phone-ins, page-ins and write-ins are the strategies used to involve listeners.52

The main roadblock to the further growth of private FM broadcasting is the low percentage of FM radio sets, the reluctance of AIR authorities to let go of their control, and the efforts of the private broadcasters to hold on to their monopoly. They have resisted AIR's bid to raise the rates and lobbied against Indian companies with 25% foreign equity bidding for time on the FM channels. FM radio technology facilitates localisation of broadcasting, and the operation of a large number of stations. New York, for instance, has as many as 82 stations; London has 42, and Jakarta 29, while New Delhi has only 5. Transmission bands for FM radio range between 80 and 108 Mhz, though the Indian government has kept 80-108 Mhz for its own services. Still, 13 frequencies are available for a whole lot of stations in different languages in cities. AIR plans to extend FM broadcasting to many more cities.

Digital Audio Broadcasting (DAB)

Broadcasters including All India Radio, are to introduce DAB during the next few years. DAB technology arose out of a European

project called Eureka-147 and broadcasting using this technology was started by the BBC in 1995 in the London region. It transmits sound as computer code rather than as analogous waves; like compact disc (CD) technology it gives inference-free sound. Though primarily an audio medium, it can also carry multimedia services such as text, data files, graphics, figures and moving video. Thus, DAB listeners can listen to music accompanied by information and pictures on their computer screens. There are other uses too for the technology: it can be used for carrying tourist and travel information to computer terminals; to transmit traffic information to ears equipped with multimedia DAB receivers, and to send data to notebook computers and mobile figures.53

The News Services Division of AIR collects news and opinions on current events as they occur and broadcasts them in news bulletins and features. The ITC has shown more initiative and independence from the I B Ministry in recent years, but it is still not completely autonomous. Perhaps people outside India do not know the gigantic nature of the Indian radio broadcasting system. AIR, for example, broadcasts 250 news bulletins in different languages, of which 68 are broadcast from the Delhi station. Other stations relay them. The regional stations broadcast 119 bulletins in 23 languages and 35 tribal dialects. Listeners abroad get 63 AIR bulletins in 25 languages. When Parliament is in session, English and Hindi news analyses are given from AIR Delhi. Similarly, stations in the state capitals bring out analytical features when the respective state assemblies are in session.

The External Services Division of AIR broadcasts in 17 Indian

53 Chatterjee, P. C., Broadcasting in India, op. cit.,
languages and eight foreign languages for 56 programme-hours every day, besides releasing 300 news bulletins in major languages of the world. AIR maintains original recordings of the voice and speeches of great national leaders including Mahatma Gandhi, Jawaharlal Nehru and Indira Gandhi in its Sound Archives Library. The renderings of famous Hindustani and Carnatic musicians are also kept in the Archives. A special effort is made to collect historical material of lasting importance and preserve it in the Archives. There are worthy educational efforts being made by AIR now. Gayanvanti of the Indira Gandhi National Open University (IGNOU), for example, is an educational programme of AIR which is of great help to people of all ages who wish to pursue higher education during their spare time.

As for the future, AIR has to take full advantage of the transistor revolution that started in the world some four decades ago, so that people living in far-off, mountainous or hilly regions of India can be reached with music and news. There is no doubt that in the current economic situation the radio is the most affordable and effective medium of communication in India. Radio is already the most popular medium in the rural areas but we can do more to increase rural participation in the communications revolution already in progress in India.54

Similarly, educational programmes broadcast on AIR channels can be made more attractive and useful, especially through a change in the scheduling so that more learners can take full advantage of the system and improve their knowledge, not only of conventional subjects but also of marketable skills through value-added, job-oriented educational programmes. Let there be a proliferation of radio stations using low-

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54 Lazarfield, P. P., Radio and Printed Page, op. cit
power transmitting systems in every educational and social institution so that more and more young people, women, workers and other social groups enter into the business of running their own lives instead of depending on mammoth and often corrupt systems that are beyond their control and totally alienated from them.

Radio is far less costly to produce than television and it can be more localized and specialized than any other mass medium. Even a couple of thousand listeners are enough to attract advertisers especially those who are trying to spread commercial messages about products and services rural people may need in these changing times. From the 200 radio stations that exist today, the number can be increased to 2,000 if more attention is paid to rural communication over the air.

If there is any mass medium in India that is truly mass in character today, it is the radio. To make it more effective and listener-oriented, a more democratic approach on the part of planners and system organizers is most essential.

Television

If the radio was an 'ethereal voice' to begin with, television was an 'ethereal spectacle'. Even the tip of a child's, finger could bring about the magic of that spectacle with just a gentle touch on the remote control. A wonderful world of strange sounds, pictures, scenes and drama, appears, along with news from the other side of the globe presented with an apparently genuine fidelity to the truth and to reality.

What flits before our eyes can make us laugh, think, react, protest, sympathize or commiserate. But the next moment, we see an Urvashi, Rambha, Tilottama or Helen, if you will, proclaiming that the heavenly
fragrance of an exotic perfume is the very secret of her beauty and tier appeal to men, or that the soft drink or soap in her hand will make life More meaningful and successful.

Another scene: A beautiful young woman appears on the screen in a wheel chair. She is paralysed from her chest down, the result of a terrible occident. How did it happen? While driving at a high speed on the highway, she reached out for the cell phone kept in her Pocket book kept on the passenger seat—and the next thing she could remember was that she was in a hospital bed. At least that's what she told the talk show host on day X after the accident; but the same young woman appears on the same show on day Y to confess that she was drunk beyond legal limits while she had the accident. She wanted to share her experience for the benefit of all drivers, young and old—never mix drinking and driving.\footnote{Whitehouse, G. E., Understanding the New Technologies of Mass Media, op. cit.}

A woman who weighed 80 kilograms underwent an exercise and diet regimen combined with a particular medicinal pill god succeeded in bringing her weight down to 60 kilograms in two weeks—so claimed the testimonial advertisement, with 'before' and 'after' pictures. A macho young man driving a sleek, sexy automobile along a mountain road suddenly screeches to a halt at the edge of a cliff in a dare-devil stunt—just to demonstrate the effectiveness of the car's brakes. But nothing was more dramatic than the high-tech suicide mission accomplished by some young men from Saudi Arabia who hijacked planes in Boston and directed them to the twin towers of the World Trade Centre in New York. Television networks not only in the US but throughout the world endlessly repeated the clips showing this terrible destruction of human lives and high-rise buildings. 9/11 is still a nightmare not only for Americans but for people all over the
All these scenes flash before the viewer in quick succession. What doe, the viewer retain in her memory? Are all the items in the parade before her of the same importance? The viewer is bombarded with a series of scenes and narrations; she has to make her choice on the basis of her intrapersonal orientation and mental make-up. That is the big challenge offered by the most influential medium of public communication, namely, television, soul, times called the 'idiot box' 'the chewing gum for the eye'.

Viewing of television and discussing programme contents with others are common habits prevalent among people living in the modern era. Television viewing has become entrenched among those living in most urban and some rural areas of almost all nations these days. We do have to recognize, however, that almost half the population of the world has never used a telephone, not to speak of a radio or television—such is the imbalance in people's media use. But we are concerned here with the spread of television as a medium of entertainment, information and education among half the world's population.

*The Pioneers of Television*

Television—seeing things from distant places, even as distant as the planets or objects in space—became a household word and a household appliance in the late 1940s or early 1950s in Europe and the US. In other parts of the world, it reached that status only in the late 1960s, although some crude form of the television was available in many parts of the world during the late 1950s.

The first practical device for transmitting the likeness of an image over a distance was invented by Paul Nipkow, a German inventor, who
patented his 'Electric Telescope' in 1884. Nipkow used a rotating disc with small holes drilled through it in a spiral pattern. The Nipkow disc was of the same size as a gramophone record and the holes on it were quite small. When light rays were sent through the holes and the disc rotated at high speed simultaneously, they could be resolved into light and dark dots that could be sent over the wires. Although many other scientists and inventors contributed to the development of television, everyone seems to agree that it was Nipkow's concept of sending images as light and dark dots over a distance that prompted them to take up their own inventing missions. Hence Nipkow is considered the prime mover of the concept of television.

The word 'television' was first used by Constantin Perskyi in a scientific paper he presented at the International Electricity Congress held in Paris on 25 August 1900. Perskyi described an apparatus based on the magnetic properties of selenium, an element that helped in the transmission of pictures through electromagnetic radiation. According to Shirley Biagi, the word first appeared in the United States in the June 1907 issue of Scientific American. It is interesting to note that before this word became widely accepted, inventors used 'telephoto', 'telectroscope', 'wireless pictures', 'visual wireless', 'visual radio', 'electric vision', electric telescope', and other terms to describe the precursors of the television. The marvel of television lies in the near-instantaneous transfer of pictures and sounds from the place where a performance or event takes place to the receiver kept far away; the transmitter and the receiver could be thousands of miles apart. Televised pictures of the Apollo moon flight and the subsequent space missions are examples of satellite communication.

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The recording of audio and visual material and their transmission and reception in the television system are very complex scientific and technical processes. Readers are referred to standard textbooks on electronic recording, transmission and reception of signals including the working of the television camera, electronic gun, and black-and-white versus colour television.

Stated succinctly, the television camera captures the image with sound and converts it into dots that travel at the speed of light to the receiving point. Although picture and sound are recorded together, picture signals are transmitted separately. By adjusting the time of despatch, the two signals which are of different velocities are made to reach the receiver at the same time. The signals are sent from a transmitting tower, usually made of steel and standing higher than the nearby buildings and hills to avoid obstruction to the electromagnetic waves, which travel in straight lines. The distance travelled by the waves depends on their power and on the height of the transmitting tower. Usually television signals sent by high power transmitters (HPT) can travel uninterruptedly for 80-160 kilometres and those sent by low power transmitters (LPT) for 25-50 kilometres.

After Nipkow there were many pioneers whose contributions to the development of the television system are quite important. For example, do invention of the cathode ray tube (CRT) was of great significance. Alan AA Swinton of England conducted several experiments that proved that 'distant electric vision' was possible with tubes using cathode rays at both the receiving as well as the transmitting stations. Light was converted to electricity and vice versa. Unknown to Swinton, Max Dieckmann in Germany and Borth Rozing of Russia were working on the same scientific problem. All these scientists came up with different devices
during 1909-10.\textsuperscript{57}

The contributions already made by Marconi, and a little later by Fessenden, De Forest, Braun, Armstrong, Conrad and others to radio and wireless communication indirectly helped in the development of the television system. But the biggest invention was that of the iconoscope, which could send not only visual images in dots through the atmosphere to distant places but also help the receiver capture signals and convert them back to visual images. The scientist who was responsible for this was Vladimir Zworykin, a researcher in the Westinghouse Company in the US who had also patented his picture tube in 1923. Zworykin worked with a handsome grant from David Sarnoff, head of RCA.

Meanwhile, John Logie Baird of London, who was experimenting with television, filed for his patent in July 1923. In April 1925, he set up his television apparatus in a London department store and demonstrated the first crude functioning of television. With further improvements made in his apparatus, Baird demonstrated his system before the general public on 26 January 1926, which, according to Abramson, was the 'first public demonstration of television'.\textsuperscript{58}

Philo T. Farnsworth developed a CRT in his California lab and called it the 'dissector tube'. It could produce images that were 10 times clearer than the ones produced by his predecessors. Farnsworth patented his invention in 1930, when he was 24 years old. When Zworykin moved from Westinghouse to RCA in 1930, he visited Farnsworth. Both he and his boss Sarnoff were impressed by Farnsworth's invention, and they decided to make use of it.

\textsuperscript{57} Orlik, P. B., The Electronic Media: An Introduction to Profession, op. cit., p. 92.
\textsuperscript{58} Ibid.
In April 1935, Sarnoff decided that RCA would spend a million dollars to conduct television demonstrations at the 1939-40 New York World's Fair through NBC, the broadcasting company owned by RCA.

The Spread of Television

Soon after World War II, Sarnoff and Paley developed their networks, NBC and CBS. Hundreds of television channels appeared and television made a significant mark on the cultural lives of Americans. It was not difficult for the companies to expand the market for television, although it began to supplant radio, their parent business. In programming also, the television networks followed the radio networks, with music, drama, skits, talk shows, comedies, etc. Although early television programmes were broadcast live, most are now taped and presented, except news, sports and important cultural programmes of global significance, such as Live Aid, which are telecast live.

Early television channels had frequencies in the VHF (very high frequency) range (30-300 mHz). In the mid-1950s, the frequencies in the UHF (ultra high frequency) range, from 300 to 3,000 mHz, were allocated by the FCC (Federal Communications Commission) to broadcasters, in the US. Since higher frequency electromagnetic waves do not travel as far as lower frequency waves, the UHF stations usually have smaller audiences than VHF stations. With the growth of cable television, many UHF stations began to rely on cable technology to carry their signals to homes.

Cable television was the most important technical development in television in the 1970s. Originally, cable TV was known as Community Antenna Television (CATV), and it was started in the mountainous regions of the US and Europe where reception of signals was murky or inadequate.
CATV had its humble beginnings in the late 1940s in a few areas, but with the arrival of fibre-optics the cable technology burgeoned in the 1970s.

From 1972 onwards, cable TV was utilized by Time, Inc.'s Home Box Office (HBO) for showing movies to subscribers who had to pay a fee every month for the service. Now, dozens of cable television networks offer a variety of programming through local channels to subscribers—children's programmes, women's programmes, special programmes for ethnic minorities in the US, such as Hispanics, Asians and others.

There are Music TV (MTV) and VH1, channels that are devoted entirely to music; there are the all-sports channel, ESPN (Entertainment and Sports Network), and the all-business Consumer and Business Channel; there is an all-religion Interfaith channel. There are variations of these channels in different countries. The cable giants of the world are TNT (Turner Network Television), ESPN, AOL Time-Warner's HBO and CNN (Cable News Network). The coaxial cable in the cable TV system has no spectrum limitations, whereas the ordinary telecasting spectrum has limitations. Cable TV homes can have a TV-Internet-e-mail combination. With minor modifications, it can also be useful in telebanking and teleshopping.⁵⁹

For viewing cinemascope films, high-resolution wide-screen TV systems and flat-surface screens are used in high-definition TV (HDTV). Digital TV is likely to become popular in the near future. Digital systems have already become part of the telephone system. When they come to radio and television, media users will be able to 'talk back' to their radio and television sets; that is, use the digital system to query the broadcaster

of a particular programme! This means that the media will become interactive. The other major changes in technology introduced in recent years are: big screens up to 84 inches wide; flat screens; the combination of computerized systems with television sets that can access the Internet and e-mail; holograms and virtual reality (VR); and facilities for interactive communication, playing of videogames, video discs, etc. The television set is no longer merely for receiving programmes telecast on a particular channel, it is now a multimedia system and a personalized entertainment device.

With this background information about the development of television, let us now turn to Indian television. In Hindi it is called *doordarshan*, which literally means tele-vision, *door* (pronounced like 'poor') meaning 'far' and *darshan* meaning 'sight' or 'vision'.

*Doordarshan*

All India Radio (AIR) in collaboration with UNESCO set up a television centre in New Delhi on 15 September 1959, purely as an educational experiment. The Ford Foundation donated 250 television sets to selected schools in the Delhi area. In a few months, television was extended to another 250 schools. Gradually, some community sets were installed in the suburbs of Delhi. Teleclubs were established for viewers to discuss programme contents, effectiveness, etc. Programmes were telecast from a temporary studio in the AIR building, using a 500-Watt transmitter with a range of 25 kilometres.

Initially, all the programmes were meant for children. Then came some programmes for the general public in the suburbs of Delhi. A few weeks later, there were programmes for agriculturists in the suburban villages of Delhi. In 1972, TV stations were opened in Bombay and Madras;
in 1973, a relay station started operation in Poona, a hundred miles from Bombay. On 1 April 1976, the television unit was separated from AIR and given the name Doordarshan (DD). The activities of television were increased. Today, almost a thousand transmitters send programmes to different stations located in all the metropolitan cities, large industrial towns, state capitals and few rural areas.

The four metro centres of New Delhi, Mumbai, Kolkata and Chennai have the DD-1, DD-2 and DD-3 channels. There are 11 regional centres where DD-1 and DD-2 channels operate. There are also 21 local channels. In fact, the number of channels needs to be expanded, especially in the rural areas where low-power transmitters (LPTs) are set up expand only with improvement in living conditions and higher standards of income through steady employment and health care. Media use does not depend on technical capability. Existing technical facilities are capable of reaching 90 per cent or more of the population but, in actual practice, the bulk of media users are in the metropolitan areas, state capitals and a few very large industrial and business towns such as Jamshedpur and Kanpur.

PAS-1 and PAS-4 are satellites whose transponders help in the telecasting of DD programmes in half the regions of the world. An international channel called DD-International was started in 1995 and it telecasts programmes for 19 hours a day to foreign countries—via PAS-4 to Europe, Asia and Africa, and via PAS-1 to North America.

Satellite Instructional Television Experiment (SITE)

One of the most extensive educational and social research projects,

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60 Chatterjee, P. C., Broadcasting in India, op. cit., pp. 257-278.
perhaps the largest national television experiment in the world, has been SITE. The Indian National Satellite (INSAT) was put into orbit following the favourable results of SITE. The effectiveness of television as a medium for educating the masses in rural areas was underscored by this experiment. It was with the help of NASA, UNDP, ITU and UNESCO that the Indian Space Research Organization (ISRO) succeeded in launching SITE on 1 August 1975 using the US-supplied Applications Technology Satellite, ATS-6.

Thousands of messages on topics generally considered development-oriented were telecast to community television sets kept in 2,400 villages in 20 districts spread across six Indian states: Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Orissa and Rajasthan. The experiment ended on 31 July 1976. The programmes telecast dealt with high-yielding varieties of seeds, better farming methods and management, family planning, public health, social and educational improvement of women and children, better learning and teaching methods.

The one year experiment led to the unprecedented expansion of television in India, SITE influenced the course of television in India; it led to the establishment of HPTs (high-power transmitters) in most urban areas and LPTs in some selected rural areas.

Internet

The first time computer came to existence in 1960, since then information technology has changed the way business or commerce is conducted across the globe. Businesses are re-orienting themselves in this highly competitive era where product life-cycles are coming down everyday, globalisation of markets are taking place with formation of
trade blocks across the globe, and world moving towards a global village. Complex issues of cultural divide within even the same trade block forces the businesses to learn more about the customer, if possible to an individual level.

From mainframes to accounting systems, the personal computer revolution, local area networks, electronic data interchange, client/server design, and enterprise resource planning have all had a hand in shaping today's business organization. The past few years have been Internet years, however, when companies worldwide have embraced a change without equal. It is a change that promises to have more effect and be more lasting than anything we have seen to date.

The Internet (also known simply as "the Net" or less precisely as "the Web") is a more interactive medium of mass media, and can be briefly described as "a network of networks". Specifically, it is the worldwide, publicly accessible network of interconnected computer networks that transmit data by packet switching using the standard Internet Protocol (IP). It consists of millions of smaller domestic, academic, business, and governmental networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked Web pages and other documents of the World Wide Web.  

Contrary to some common usage, the Internet and the World Wide Web are not synonymous: the Internet is the system of interconnected computer networks, linked by copper wires, fiber-optic cables, wireless connections etc.; the Web is the contents, or the interconnected

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documents, linked by hyperlinks and URLs. The World Wide Web is accessible through the Internet, along with many other services including e-mail, file sharing and others described below.

Toward the end of the 20th century, the advent of the World Wide Web marked the first era in which most individuals could have a means of exposure on a scale comparable to that of mass media. Anyone with a web site has the potential to address a global audience, although serving to high levels of web traffics is still relatively expensive. It is possible that the rise of peer-to-peer technologies may have begun the process of making the cost of bandwidth manageable. Although a vast amount of information, imagery, and commentary (i.e. "content") has been made available, it is often difficult to determine the authenticity and reliability of information contained in web pages (in many cases, self-published). The invention of the Internet has also allowed breaking news stories to reach around the globe within minutes. This rapid growth of instantaneous, decentralized communication is often deemed likely to change mass media and its relationship to society.

"Cross-media" means the idea of distributing the same message through different media channels. A similar idea is expressed in the news industry as "convergence". Many authors understand cross-media publishing to be the ability to publish in both print and on the web without manual conversion effort. An increasing number of wireless devices with mutually incompatible data and screen formats make it even more difficult to achieve the objective “create once, publish many”. 62

The internet is quickly becoming the center of mass media. Everything is becoming accessible via the internet. Instead of picking up

62 Ibid.
a newspaper, or watching the 10 o'clock news, people will log onto the internet to get the news they want, when they want it. Many workers listen to the radio through the internet while sitting at their desk. Games are played through the internet.

Technology is setting the pace for how a company does business, how it starts new products and enters a new market, how it deals with suppliers, and how it communicates with customers and others in the new marketplace. Further this is a new media of the ICE age. This makes it very unconventional and highly unpredictable. As it is regularly undergoing changes technologically and conceptually beaten paths are not being established. In fact it also enables competitors to become copycats within shorter and shorter time frames.

This technology was originally developed by scientists as a tool to keep in touch with one another. This is the way many of us use it even today. The application of internet has key individual enterprises, business, government across the globe today. On the individual side it has given them the power they never had in the past and they are enjoying it. Instead of rushed phone calls or the occasional letters/notes one can exchange message across the globe at a negligible cost, the regular updation of knowledge. On the enterprise and business end it has assisted in providing IT enabled solutions like e-commerce, enterprise resource planning (ERP) etc.63

Closed enterprise systems are giving way to open system environments, where customers connect to the company's Web site, and trading partners connect by an Extranet and the Internet.

The starting of the Internet dates back to the late 1960s, when the advanced Research Projects Agency of the Department of Defense formed ARPANET. The agency was situated in the late 1950s to E-Commerce develop information technologies to assist the United States to counter the Soviet start of Sputnik. Consequently, the early ARPANET consisted primarily of research universities and military contractors with computers linked by telephone lines leased from AT&T. The chronological development of the ARPANET and the milestones leading to the Internet reflect a history of top-down government-sponsored initiatives.

The internet is quickly becoming the center of mass media. Everything is becoming accessible via the internet. Instead of picking up a newspaper, or watching the 10 o'clock news, people will log onto the internet to get the news they want, when they want it. Many workers listen to the radio through the internet while sitting at their desk. Games are played through the internet.

The Internet and Education:

Findings of the Pew Internet & American Life Project Even the education system relies on the internet. Teachers can contact the entire class by sending one e-mail. They have web pages where students can get another copy of the class outline or assignments. Some classes even have class blogs where students must post weekly, and are graded on their contributions. The internet thus far has become an extremely dominant form of media.

In 1998 the Internet had about 50 million users, supported by approximately 25 million servers (Web and e-mail hosting sites, for example, but not desktops or laptops). In that same year, the Internet Corporation for Assigned Names and Numbers (ICANN)\(^6\) was created. Internet companies such as Netscape Communications, Yahoo!, eBay, and Amazon were already 3 to 4 years old and the Internet was in the middle of its so-called "dot-boom" period. Google emerged that year as a highly speculative effort to "organize the world's information and make it accessible and useful." Investment in anything related to the Internet was called "irrational exuberance" by the then head of the U.S. Federal Reserve Bank, Alan Greenspan.\(^6\)

By April 2000, the Internet boom ended—at least in the United States—and a notable decline in investment in Internet application providers and infrastructure ensued. Domino effects resulted for router vendors, Internet service providers, and application providers. An underlying demand for Internet services remained, however, and it continued to grow, in part because of the growth in the number of Internet users worldwide.

During this same period, access to the Internet began to shift from dial-up speeds (on the order of kilobits to tens of kilobits per second) to broadband speeds (often measured in megabits per second). New access technologies such as digital subscriber loops and dedicated fiber raised consumer expectations of Internet capacity, in turn triggering much interest in streaming applications such as voice and video. In some locales, consumers could obtain gigabit access to the Internet (for

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\(^{65}\) Ibid.

example, in Japan and Stockholm). In addition, mobile access increased rapidly as mobile technology spread throughout the world, especially in regions where wireline telephony had been slow to develop.

Today the Internet has an estimated 542 million servers and about 1.3 billion users. Of the estimated 3 billion mobile phones in use, about 15 percent are Internet-enabled, adding 450 million devices to the Internet. In addition, at least 1 billion personal computers are in use, a significant fraction of which also have access to the Internet. The diversity of devices and access speeds on the Internet combine to produce challenges and opportunities for Internet application providers around the world. Highly variable speeds, display areas, and physical modes of interaction create a rich but complex canvas on which to develop new Internet applications and adapt older ones.

Another well-documented but unexpected development during this same decade is the dramatic increase in user-produced content on the Internet. There is no question that users contributed strongly to the utility of the Internet as the World Wide Web made its debut in the early 1990s with a rapidly growing menu of Web pages. But higher speeds have encouraged user-produced audio and video archives (Napster and YouTube), as well as sharing of all forms of digital content through peer-to-peer protocols. Voice over IP, once a novelty, is very common, together with video conferencing (iChat from Apple, for example).

Geographically indexed information has also emerged as a major resource for Internet users. In the scientific realm, Google Earth and Google Maps are frequently used to display scientific data, sensor
measurements, and so on. Local consumer information is another common theme. 67

Even the media that have traditionally been delivered electronically such as telephony, television, and radio are being changed by digital technology and the Internet. These media can now be delivered from countless sources to equally countless destinations over the Internet. It is common to think of these media as being delivered in streaming modes (that is, packets delivered in real time), but this need not be the case for material that has been prerecorded. Users of iPods have already discovered that they can download music faster than they can listen to it.

With gigabit access to the Internet, one could download an hour's worth of conventional video in about 16 seconds. This fact certainly changes the understanding of "video on demand" from a streaming delivery to a file transfer. The latter is much easier on the Internet because one is not concerned about packet inter-arrival times (jitter), loss, or even orderly delivery because the packets can be reordered and retransmitted during the file transfer. Now about 10 hours of video are being uploaded to YouTube per second. The battles over Quality of Service (QoS) are probably not over yet either. Services such as Skype and applications such as iChat from Apple demonstrate the feasibility of credible, real-time audio and video conferencing on the "best-efforts" public Internet. I have been surprised by the quality that is possible when both parties have reasonably high-capacity access to the Internet.

Technorati is said to be tracking on the order of 112 million blogs, and the China Internet Network Information Center (CNNIC) estimates

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72 million Chinese blogs that are probably in addition to those tracked by Technorati. Adding to these are billions of Web pages and, perhaps even more significant, an unknown amount of information online in the form of large databases. The latter are not indexed in the same way that Web pages can be, but probably contain more information. Think about high-energy physics information, images from the Hubble and other telescopes, radio telescope data including the Search for Extra-Terrestrial Intelligence (SETI)\textsuperscript{68}, and you quickly conclude that our modern society is awash in digital information.

The year 2008 also marks the tenth anniversary of a project that started at the U.S. Jet Propulsion Laboratory: \textit{The Interplanetary Internet}. This effort began as a protocol design exercise to see what would have to change to make Internet-like capability available to manned and robotic spacecraft. The idea was to develop networking technology that would provide to the space exploration field the kind of rich and interoperable networking between spacecraft of any (Earth) origin that we enjoy between devices on the Internet.

The design team quickly recognized that the standard TCP/IP protocols would not overcome some of the long delays and disruptions to be expected in deep space communication. A new set of protocols evolved that could operate above the conventional Internet or on underlying transport protocols more suited to long delays and disruption. Called "delay and disruption tolerant networking"\textsuperscript{69} or DTN, this suite of protocols is layered in the same abstract way as the Internet. The Interplanetary system could be thought of as a network of Internets,


\textsuperscript{69} Ibid.
Although it is not constrained to use conventional Internet protocols. The analog of IP is called the Bundle Protocol\(^7\), and this protocol can run above TCP or the User Datagram Protocol (UDP) or the new Licklider Transport Protocol (for deep space application). Ironically, the DTN protocol suite has also proven to be useful for terrestrial applications in which delay and disruption are common: tactical military communication and civilian mobile communication.

After 10 years of work, the DTN system will be tested onboard the Deep Impact mission platform late in 2008 as part of a program to qualify the new technology for use in future space missions. It is hoped that this protocol suite can be standardized for use by any of the world's space agencies so that spacecraft from any country will be interoperable with spacecraft of other countries and available to support new missions if they are still operational and have completed their primary missions. Such a situation already exists on Mars, where the Rovers are using previously launched orbital satellites to relay information to Earth's Deep Space Network using store-and-forward techniques like those common to the Internet. The Internet has gone from dial-up to deep space in just the past 10 years. One can only begin to speculate about its application and condition 10 years hence.\(^{71}\)

**Blogs (Web Logs)**

Blogging has become a huge form of media. A blog is a website, usually maintained by an individual, with regular entries of commentary, descriptions of events, or other material such as graphics or video. Entries


are commonly displayed in reverse chronological order. Many blogs provide commentary or news on a particular subject; others function as more personal online diaries. A typical blog combines text, images, and links to other blogs, web pages, and other media related to its topic. The ability for 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 (artlog), photographs (photoblog), sketchblog, videos (vlog), music (MP3 blog), audio (podcasting) are part of a wider network of social media. Micro-blogging is another type of blogging which consists of blogs with very short posts.

**RSS feeds**

RSS is a format for syndicating news and the content of news-like sites, including major news sites like Wired, news-oriented community sites like Slashdot, and personal blogs. It is a family of Web feed formats used to publish frequently updated content such as blog entries, news headlines, and podcasts. An RSS document (which is called a "feed" or "web feed" or "channel") contains either a summary of content from an associated web site or the full text. RSS makes it possible for people to keep up with web sites in an automated manner that can be piped into special programs or filtered displays.\(^{72}\)

**Podcast**

A podcast is a series of digital-media files which are distributed over the Internet using syndication feeds for playback on portable media players and computers. The term podcast, like broadcast, can refer either to the series of content itself or to the method by which it is syndicated;

the latter is also called podcasting. The host or author of a podcast is often called a podcaster.

**Mobile**

Mobile phones were introduced in Japan in 1979 but became a mass media only in 1998 when the first downloadable ringing tones were introduced in Finland. Soon most forms of media content were introduced on mobile phones, and today the total value of media consumed on mobile towers over that of internet content, and was worth over 31 billion dollars in 2007 (source Informa). The mobile media content includes over 8 billion dollars worth of mobile music (ringing tones, ringback tones, truetones, MP3 files, karaoke, music videos, music streaming services etc); over 5 billion dollars worth of mobile gaming; and various news, entertainment and advertising services. In Japan mobile phone books are so popular that five of the ten best-selling printed books were originally released as mobile phone books.\(^73\)

Similar to the internet, mobile is also an interactive media, but has far wider reach, with 3.3 billion mobile phone users at the end of 2007 to 1.3 billion internet users (source ITU). Like email on the internet, the top application on mobile is also a personal messaging service, but SMS text messaging is used by over 2.4 billion people. Practically all internet services and applications exist or have similar cousins on mobile, from search to multiplayer games to virtual worlds to blogs.\(^74\) Mobile has several unique benefits which many mobile media pundits claim make mobile a more powerful media than either TV or the internet, starting with mobile being permanently carried and always connected. Mobile has

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\(^{73}\) Caron, A. H. and Caronia, L., Moving Cultures: Mobile Communication in Everyday Life, op. cit., p. 450.

\(^{74}\) Ibid.
the best audience accuracy and is the only mass media with a built-in payment channel available to every user without any credit cards or paypal accounts or even an age limit. Mobile is often called the 7th Mass Medium and either the fourth screen (if counting cinema, TV and PC screens) or the third screen (counting only TV and PC).

Publishing

Publishing is the industry concerned with the production of literature or information – the activity of making information available for public view. In some cases, authors may be their own publishers.

Traditionally, the term refers to the distribution of printed works such as books and newspapers. With the advent of digital information systems and the Internet, the scope of publishing has expanded to include websites, blogs, and the like. As a business, publishing includes the development, marketing, production, and distribution of newspapers, magazines, books, literary works, musical works, software, other works dealing with information.75

Publication is also important as a legal concept; (1) as the process of giving formal notice to the world of a significant intention, for example, to marry or enter bankruptcy, and; (2) as the essential precondition of being able to claim defamation; that is, the alleged libel must have been published.

Book

A book is a collection of sheets of paper, parchment or other material with a piece of text written on them, bound together along one

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edge within covers. A book is also a literary work or a main division of such a work. A book produced in electronic format is known as an e-book.

Magazine

A magazine is a periodical publication containing a variety of articles, generally financed by advertising and/or purchase by readers. Magazines are typically published weekly, biweekly, monthly, bimonthly or quarterly, with a date on the cover that is in advance of the date it is actually published. They are often printed in color on coated paper, and are bound with a soft cover.

Magazines fall into two broad categories: consumer magazines and business magazines. In practice, magazines are a subset of periodicals, distinct from those periodicals produced by scientific, artistic, academic or special interest publishers which are subscription-only, more expensive, narrowly limited in circulation, and often have little or no advertising.

Magazines can be classified as: General interest magazines (e.g. Frontline, India Today, The Week, The Sunday Indian etc); Special interest magazines (women's, sports, business, scuba diving, etc)\textsuperscript{76}

Newspaper

A newspaper is a publication containing news and information and advertising, usually printed on low-cost paper called newsprint. It may be general or special interest, most often published daily or weekly. The first

printed newspaper was published in 1605, and the form has thrived even in the face of competition from technologies such as radio and television. Recent developments on the Internet are posing major threats to its business model, however. Paid circulation is declining in most countries, and advertising revenue, which makes up the bulk of a newspaper's income, is shifting from print to online; some commentators, nevertheless, point out that historically new media such as radio and television did not entirely supplant existing.77

Software Publishing

A software publisher is a publishing company in the software industry between the developer and the distributor. In some companies, two or all three of these roles may be combined (and indeed, may reside in a single person, especially in the case of shareware).

Software publishers often license software from developers with specific limitations, such as a time limit or geographical region. The terms of licensing vary enormously, and are typically secret. Developers may use publishers to reach larger or foreign markets, or to avoid focussing on marketing. Or publishers may use developers to create software to meet a market need that the publisher has identified.

Video games

A video game is a computer-controlled game where a video display such as a monitor or television is the primary feedback device. The term "computer game" also includes games which display only text (and which can therefore theoretically be played on a teletypewriter) or which use other methods, such as sound or vibration, as their primary

77 Ibid.
feedback device, but there are very few new games in these categories. There always must also be some sort of input device, usually in the form of button/joystick combinations (on arcade games), a keyboard & mouse/trackball combination (computer games), or a controller (console games), or a combination of any of the above. Also, more esoteric devices have been used for input. Usually there are rules and goals, but in more open-ended games the player may be free to do whatever they like within the confines of the virtual universe.

In common usage, a "computer game" or a "PC game" refers to a game that is played on a personal computer. "Console game" refers to one that is played on a device specifically designed for the use of such, while interfacing with a standard television set. "Arcade game" refers to a game designed to be played in an establishment in which patrons pay to play on a per-use basis. "Video game" (or "videogame") has evolved into a catchall phrase that encompasses the aforementioned along with any game made for any other device, including, but not limited to, mobile phones, PDAs, advanced calculators, etc.78

Computer

The term Computer, originally meant a person capable of performing numerical calculations with the help of a mechanical computing device. The evolution of computers started way back in the late 1930s. Binary arithmetic is at the core of the computers of all times. History of computers dates back to the invention of a mechanical adding machine in 1642. ABACUS, an early computing tool, invention of logarithm by John Napier and the invention of slide rules by William

Oughtred were significant events in the evolution of computers from these early computing devices.

In the evolution of computers their first generation was characterized by the use of vacuum tubes. These computers were expensive and bulky. They used machine language for computing and could solve just one problem at a time. They did not support multitasking.

It was in 1937 that John V. Atanasoff devised the first digital electronic computer. Atanasoff and Clifford Berry came up with the ABC prototype in the November of 1939. Its computations were based on a vacuum tube and it used regenerative capacitor memory.

Konrad Zuse’s electromechanical ‘Z Machines’, especially the Z3 of 1941 was a notable achievement in the evolution of computers. It was the first machine to include binary and floating-point arithmetic and a considerable amount of programmability. In 1998, since it was proved to be Turing complete, it is regarded as world’s first operational computer.

In 1943, the Colossus was secretly designed at Bletchley Park, Britain to decode German messages. The Harvard Mark I of 1944 was a large-scale electromechanical computer with less programmability. It was another step forward in the evolution of computers.

The U.S. Army's Ballistics Research Laboratory came up with the Electronic Numerical Integrator And Computer (ENIAC) in 1946. It came to be known as the first general purpose electronic computer. However it was required to be rewired to change it’s programming thus making its architecture inflexible. Developers of ENIAC realized the flaws in the architecture and developed a better architecture. It was known as the stored program architecture or von Neumann Architecture. It got its name
after John von Neumann, who for the first time described the architecture in 1945. All the projects of developing computers taken up thereafter have been using the von Neumann Architecture. All the computers use a ‘stored program architecture’, which is now a part of the definition of the word ‘computer’. 79

The U.S. National Bureau of Standards came up with Standards Electronic/Eastern Automatic Computer (SEAC) in 1950. Diodes handled all the logic making it the first computer to base its logic on solid devices. IBM announced the IBM 702 Electronic Data Processing Machine in 1953. It was developed for business use and could address scientific and engineering applications. Till the 1950s all computers that were used were vacuum tube based.

In the 1960s, transistor based computers replaced vacuum tubes. Transistors made computers smaller and cheaper. They made computers energy efficient. But transistors were responsible for the emission of large amounts of heat from the computer. Due to this computers were subject to damage. The use of transistors marked the second generation of computers. Computers belonging to this generation used punched cards for input. They used assembly language.

• Stanford Research Institute brought about ERMA, Electronic Recording Machine Accounting Project, which dealt with automation of the process of bookkeeping in banking.
• In 1959, General Electric Corporation delivered its ERMA computing system to the Bank of America in California.

79 Ibid.
The use of Integrated circuits ushered in the third generation of computers. Small transistors placed on silicon chips, called semiconductors. This increased the speed and efficiency of computers. Operating systems were the human interface to computing operations and keyboards and monitors became the input-output devices.  

- In 1968, DEC launched the first mini computer called the PDP-8.
- In 1969, the development of ARPANET began with the financial backing of the Department Of Defense.

Thousands of integrated circuits placed onto a silicon chip made up a microprocessor. Introduction of microprocessors was the hallmark of fourth generation computers.

- Intel produced large-scale integration circuits in 1971. During the same year, Micro Computer came up with microprocessor and Ted Hoff, working for Intel introduced 4-bit 4004.
- In 1972, Intel introduced the 8080 microprocessors.
- In 1974, Xerox came up with Alto workstation at PARC. It consisted of a monitor, a graphical interface, a mouse, and an Ethernet card for networking.
- Apple Computer brought about the Macintosh personal computer January 24 1984.  

The fifth generation computers are under development. They are going to be based on principles of artificial intelligence and natural language recognition. Developers are aiming at computers capable of organizing themselves. The evolution of computers continues.

80 Lapham, Lewis, H., Understanding Media: The Extensions of Man (New York: Gingko Press), 2003
81 Ibid.