CHAPTER – II

The Spread of Telecommunication

There is a giant on this earth.

His hands can easily pick up a locomotive.

His feet can cover thousands of miles in a day.

His wings can take him over the clouds, higher than any bird can fly.

His fins are stronger than those of any fish.

His eyes see the invisible, his ears hear words spoken at the other end of the world.

M Ilyin Y Segal, in How Man Became a Giant (pp8)

One can make money from Internet. A Delhi company has launched a shopping mall on the Net through which one can order fresh and frozen vegetables, groceries, music cassettes and magazines and much more, from within the cozy confines of one’s home. “Order from your desktop and receive at your doorstep” is the message. By investing just four lakh rupees for a server in the US, the entrepreneur has ensured that the service would initially be available at Delhi and Noida. “A good understanding of Internet, and willingness to try out a new business opportunity are the basic requirements” for aspiring franchisees.

This is one of the countless possibilities the communications revolution has brought to India. The beginning of this sea change in the human life style started on a slow pace about one and a half century ago.

Samuel F.B. Morse had proved in 1835 that he could send coded messages along an electric wire. But it wasn’t until four years later, by dint of strenuous lobbying, that Morse managed to persuade the US Congress to appropriate $30,000 to build a telegraph line between Washington and Baltimore. It was on the opening of that earliest line that
Morse sent his historic telegram—"What hath God wrought!" With that Morse opened the age of telecommunications and triggered one of the most dramatic commercial confrontations of the 19th century. He started a powerful process that is still unfolding in our time.¹

Because so much of business now depends on getting and sending information, companies around the world have been rushing to link their employees through electronic networks. These networks form the key infrastructure of the 21st century.

The Indian stock exchanges in Bombay and Delhi do their business via VSAT. Big Indian companies network with their outstation centres and tabulate their accounts using the same device. Transactions in banks, cashing of outstation cheques and bills could be done in a matter of a few seconds once the banks all over the country are linked to the VSAT device. Multinational companies have networked their system so uptodate that studies have shown that they save billions of dollars on paper work and travel. McDonald’s ten thousand odd restaurants in over 60 countries are networked on to over fifty different networks to collect, assemble and distribute their sales information, says one study.

IBM alone, writes Alvin Toffler in Powershift, connects 355,000 terminals around the world through a system called VNET, which in 1987 handled an estimated five trillion characters of data. By itself, a single part of that system saved IBM the purchase of 7.5 million envelopes and IBM estimates that without this, it would have needed nearly 40,000 additional employees to perform the same work.

Networking has spread down to the smallest businesses. Companies daily grow more dependent on their electronic nets for billing, ordering, tracking, and trading, for the exchange of design specifications, engineering drawings, schedules and for actually remote-controlling production lines.
Once regarded as purely administrative tools, networked information systems are increasingly seen as strategic weapons. The race to build these networks has taken on some of the urgency that accompanied the great age of railroad construction in the 19th century, when nations became aware that their fate might be tied to the extensiveness of their rail systems.²

The story of telecom in India in the early years is a classic case of head start followed by slow growth. Though telecommunication was introduced in India at the same time as in other more advanced parts of the world, its growth in India was rather poor and perched. One Englishman was carrying out some experiments in telegraphy on his own in Calcutta almost at the same time when similar experiments were being conducted by Samuel FB Morse in the United States. Morse built up a telegraph empire in US in 10 years which later came to be known as Western Union. From Morse to Mouse it is a long story.

In 1850, the Board of the Directors of East India Company allowed the construction of a telegraph line between Calcutta and Diamond Harbor and by 1851 the first telecommunication line was opened for traffic. But it was only for official use. The telegraph services were opened to the public only in 1855. Yet the network did not grow for decades.

Similar was the case with telephones. Experiments with telephones in India were also started almost at the same time when Dr. Alexander Graham Bell invented his telephone in 1876. In a few years Graham’s company became a world leader, to grow up as the biggest privately owned business the world had ever seen -- The American Telephone & Telegraph Company (AT&T). India got its first telephone exchange in 1882. The licence was given in 1881 to a British firm to install exchanges at Calcutta, Madras, Bombay, Rangoon and Karachi. And the first telephone exchange in Bombay was commissioned on 30th January, 1882.
Yet 65 years later, on the eve of Independence, there were only 9022 telegraph offices and only 403 departmental telephone exchanges. The number of telephone was 91,424 of which 2348 were private. Private branch exchanges had 30245 telephones. A licensed private company in Bihar was serving the coal-field area and had eight exchanges with 1359 telephones. It is interesting to recall that telecom service in India started in the private sector first. Later it was completely nationalised and now it has again been opened up to the private operators. Truly history has turned a full circle. 3

Independent India, after partition, on 31st March 1948 was left with still fewer (7330) telegraph offices. Departmental exchanges were 321 with 82985 telephones and 2166 private branch exchanges with another 28155 telephones.

Some systems were installed and operated by the princely states. The urgency of self rule inspired opening of public call offices in cities and important towns. On 31st March, 1948 there were 537 such public call offices throughout the country. The combined Post and Telegraph Department then had a fixed assets to the tune of Rs. 315.1 million, of which Rs. 292.6 million were for telecommunication services. There were 80873 miles (129395 km. approximately) of telegraph and trunk telephone lines and 9746 miles of local telephone lines on that date.

In the pre-independent India, Lahore was the hub of all communication circuits. Therefore, after Independence it became necessary to re-arrange the circuits and connect areas in East Punjab within the Indian territory. Consequently, Amritsar and Firozpur became the new hub of telecom circuits for connecting all important places in this area. Similarly, construction of a new line from Patna to Guwahati was completed in February, 1948 and a number of three channel and single carrier telephone systems were restored.

The mirth of Independence was tampered by the melancholy of partition. The North-West Frontier, Baluchistan and Sindh provinces were seceded to West Pakistan
along with a part of Punjab. Eastern part of Bengal and some parts of Assam (now Bangladesh) went over to East Pakistan. The partition was accompanied by large scale migration of population and vandalism of unprecedented magnitude. This shook not only the social fabric but also the economic base. Telephone and telegraph lines were also destroyed, communication disrupted because of riots.

To run the channels of administration and maintain essential communication during the disturbed state, wireless stations were established between Delhi-Amritsar, Jallandhar, Jammu, Ambala and Gurdaspur in the North-West and between Calcutta-Guwahati, Shillong, Darjeeling and Agartala in the North-East on a war footing. The tragedy did not end there. Then came the Pakistani aggression in Jammu & Kashmir. A large group of armed tribesmen entered Mujafarabad from Pakistan on 22nd October, 1947. They occupied Baramula on 27th October. Luckily for India, the Maharaja of Jammu and Kashmir, before partition, had allowed laying of communication lines connecting the capital. This made communicating with Indian troops easy. At the time of Pakistani aggression in Kashmir, all the circuits to J&K working via Lahore and Ravalpindi had been disrupted. On an emergency basis, wireless links were established between Jammu-Amritsar and New Delhi.4

During 1947-48 the number of departmental exchanges increased from 321 to 387. The number of telephone connections rose from 82,985 to 84,200 and eight new trunk exchanges were installed. Major expansion was carried out in Delhi by installing a 2000 line exchange at Connaught Place. During the year Rs. 34.7 million was invested in telecom services and the total fixed assets of the department rose to Rs. 340 million. The year saw some calamities too. A major fire broke out on the night of 25th October, 1948 in Hare Street building of Calcutta Telephones and the entire Calcutta Exchange with 6100 connections was destroyed.
During 1948-49 itself, it was planned that telecom systems in the erstwhile princely states should be taken over. The actual process started with Baroda Telephone systems in May 1949 and was completed in April, 1950.

The development of communication network during the period 1948 to 1950 continued at the initiative of the department on a year to year basis. But from the the first Five Year Plan, 1951-56, a systematic and planned approach was adopted. At the beginning of the first plan, the network was in its rudimentary state and consisted of only 464 telephone exchanges and about 168,000 telephone lines. The national planners had to address to the acute food deficit and dependence on imports even for bare necessities. They accorded high priority to agriculture, basic industries and social infrastructure like education and health. But to meet the growing demands for telephones within the available resources, the department made a serious effort.\textsuperscript{5}

A Dodged Beginning: As Freedom Knocks

The capital outlay of the Department during 1946-47 was Rs.47.2 millions. The bulk of the amount under Telegraphs and Telephones was incurred on new telephone projects consisting mainly of trunk lines and rew exchanges to provide additional facilities for civil and defence purposes.

The objective of the Indian planning to begin with was the opening of a post office in every village with a population of 2,000 or more, or in a cluster of villages. More germane to this account, they included the opening of a telegraph office in every town inhabited by a minimum of 5,000 people and in sub-divisional headquarters irrespective of its size. Every district headquarters and every town of 30,000 people or more was to have a telephone exchange by 1956 the first plan target stated. And trunk facilities extended to every sub-divisional headquarters as well as to every town boasting a population of 20,000 or more. Telephone Exchanges were to be increased first to meet the existing demand and second to keep pace with new demands from the public. The government achieved this target under much difficulty in the initial years.
In large cities Printer-gram Service was introduced and the renting of Teleprinters encouraged. The mechanisation of Bombay Central Telegraph Office was completed by the middle of 1954 at a cost of Rs. 2.1 million. The telex Service, already introduced in Bombay was popularized so that private subscribers could get in touch with each other directly over their teleprinters.

It was decided during the first plan period to reorganize the working of the posts and telegraphs factories to avoid duplication. The Jabalpur factory was to manufacture only line-stores, used in telephone and telegraph lines, the Alipore factory telegraph and electrical measuring instruments and certain telephone items, and the Bombay factory only Manual Telephone Exchanges. A sum of Rs. 8.3 million was spent on these projects and the output was expected to increase by about 30 per cent. The supply of automatic exchange equipment from the Indian Telephone Industries Factory commenced in 1952.

In collaboration with the Standard Telephone and Cable Co. of London a Telephone cable factory at Chittaranjan was set up. This factory started production in 1959. The proposal to utilise the available manufacturing capacity of private industrial concerns for the production of telecommunications equipment was also initiated. It took long for the Indian manufacturer to come of age. Today the Indian telecom industry is one of the best in the world.

The work on establishing a Telecom communications Research Organisation also started in right earnest.

The building works taken up during the early fifties include expansion of accommodation in Bombay General Post Office at a cost of Rs. 3 million, a building at Bombay at a cost of Rs. 4.5 million to accommodate all Posts and Telegraphs offices other than the General Post Office, a building in Delhi to house the office of the Director
General and other offices at a cost of Rs. 5 million and the extension of the Delhi Eastern Court building at a cost of Rs. 300,000, a new building for the office of the Post Master General, Madras and Mount Road Post Office at a cost of Rs. 1.7 million and a building for Howrah Head Office and R.M.S. Office at a cost of Rs. 1 million.

Four large training centres, one each at Hazaribagh, Baroda, Hyderabad and Bangalore were also proposed. Expansion of the Jabalpur Training Centre aimed at the training of about 90 per cent of the higher technical staff by the end of 1953-54. It was proposed to start refresher courses for the Engineers in specialised subjects like teleprinter. The capital outlay of the Department upto the end of the year 1952-53 was Rs. 640.6 million.

A Century at Snail’s Pace

The ingredient in any great idea is inspiration. Eversince Maxwell first published his electromagnetic theory of light in 1865, the possibility of generating other electromagnetic waves, differing from light waves only in length was inferred. Scientists for long worked on the possibility of wireless telegraphy. Wireless telegraphy, the science of the electric transmission of intelligence couched in telegraphic code across space without the use of connecting wires owes its origin to that basic assumption. The old Vedic theory of Shabda-Brahma (Word Eternal) must have been born of an early human hunch that what was once spoken had a universal range, far beyond the hearing range of the immediate listener.

Krishnalal Shridharani in his celebrated book “Story of The Indian Telegraphs” describes the advent of wireless telegraphy thus: Guglielmo Marconi invented the antenna in 1896 as a practical device of sound transmission. In his first successful experiments a single vertical wire broken by a spark gap was used, the lower end being grounded and the upper elevated in the air. He found that the higher his antenna, the greater the effective communicating range of his transmitter. In 1899 he was able to
establish wireless communication between two British cruisers. The great Indian
scientist Jagdish Chandra Bose also experimented with wireless transmission at the same
time as Marconi. He never patented his invention as his mind was set on the pure
realities of research, specially on plant life.\(^6\)

At the dawn of the twentieth century, Wireless Telegraphy, substantially
developed by Marconi, came into vogue all over the world. Wireless ensured shorter
time and longer distance and as its name implied independent of the wire, thus resulting
in immensely reducing the cost, specially where long distances were involved. But its
greater dependence on elements and atmosphere, with consequent fade-outs, made it less
reliable.

The Saugar Islands and the Sandheads in Diamond Harbour near Calcutta, were
connected with wireless communication in 1902. This was the first use of wireless in
India. Elephant Point and Amherst near Bombay (now Mumbai) across the sub-continent
from Diamond Harbour were next on the list. The 85 mile distance began to be
conquered in February, 1903. In April, 1904, the work was done. The engineers took
another leap, this time towards the Andaman Islands. A wireless telegraph
communication was established between Diamond Island and Port Blair in 1904. It was
this connection that opened up the Andamans for colonisation and for ‘deportation for
life’ of famous patriots like Lokmanya Tilak, Veer Savarkar and Barin Ghosh. It took
two months to erect the 150 foot masts and to install oil engines and dynamos at
Diamond Island, Slipper Island and Port Blair, a distance of 300 miles. Communication
was established on 10th February, 1905 for the first time.

\textbf{At Sea and In the Air}

A radio-telegraph station was opened in 1909 to exchange messages with those
ships which were equipped with radio telegraphy apparatus. Not only that it was
successful, it ushered in a new era in India. Shipping steamers were no more isolated islands floating in the blue ocean.

Later a chain of such stations was opened at Calcutta, Diamond Island, Table Islands and Victoria Point and these were thrown open for international traffic with ships on November, 1910. A contract with Marconi Company was placed in 1911 for three stations with a range of 600 miles each at Calcutta, Allahabad and Delhi and one station at Simla with a range of 300 miles.

Up to the end of 1918-19 the Coast Wireless Stations were controlled by the Navy and Inland stations by the Army. Most of them were later taken over by the Telegraph Department. In December 1928, the wireless stations at Karachi and Delhi commenced regular work with the Indian State Air Service. The stations at Victoria Point, Rangoon, Diamond Island and Calcutta provided wireless facilities for the Royal Air Force from Singapore. India entered the field of wireless very early. In fact the stations in Burma and the Andaman Islands which were erected in 1904 were among the earliest in the world for maintaining communication between fixed points on land.\(^7\)

A new wireless route between Madras (now Chennai) and Port Blair was opened on 1st October, 1920, which replaced the old Calcutta-Rangoon circuit. The traffic between India on one hand and Port Blair and Victoria Point on the other was now routed via Madras instead of Rangoon. A foreign radio service between Burma (now Myanmar) and the Malaysia Peninsula was opened on 15th June, 1922. Continuous reception from Penang was not possible until a more modern transmitting gear was installed there. In the meantime, transmission was improved by the fitting of valve amplifiers at Rangoon. The charge for telegrams from Myanmar was 15 annas per word.

The war years witnessed large expansion in Wireless Telegraphy with the foreign countries. On 14th January 1942, Mumbai-Australia Wireless Telegraph Service with Melbourne and Sydney was put through. On 25th February, Mumbai-China Wireless Service was inaugurated. Mumbai-New York Wireless Telegraph Service was put
across on 15th August, 1944. On the 29th of the same month a second civilian outlet to the United Kingdom via Delhi and London Wireless Telegraph Service was inaugurated.

A radio telephone service between India and Nepal was inaugurated in January 1950. This channel was provided by the installation of wireless equipment at Patna and Kathmandu, the calls being extended over the land lines on trunks to other parts of the country.\footnote{8}

For the first time in India race results were transmitted by wireless from Pune to Mumbai in August 1921, using two half kilo watt Marconi Pack sets.

Wireless continued to intrigue people. A Radio Club was formed in Chennai. Permission to broadcast, as an experimental measure, was granted during 1923-24 to one club in Calcutta and one in Mumbai. This permission was renewed, and it was extended to the Chennai Presidency Radio Club. These were the forerunners to the All India Radio. The Indian State Broadcasting Service under the supervision of the Posts and Telegraphs was organised in March, 1929.

At the end of 1939 there were 26 wireless stations in India of which twelve were under the charge of Aeronautical Wireless Service. One short wave station dealt with Wireless Meteorological Service while communications with sailing ships were maintained by five Coastal Wireless Stations. The rest were maintained for inland communication. The number of messages handled during the year by the departmental stations in India was over 700,000.

Radio stations in India continued to receive special messages from Oxford Radio either direct or via Cairo, addressed to certain newspapers and news agencies from their representatives in London. The British Official Press Communiqués broadcast from Oxford Radio were also received and passed on to the Reuters for distribution during the
whole year, except during a few weeks in June and July when atmospheric conditions combined with the low power of Oxford Radio rendered reception unreliable.

Radio communication heralded a revolutionary transformation in the Indian press. The day's news could be covered before the day was over even if it broke in distant London. Indian newspapers began to engage special representatives abroad instead of solely depending on news agencies. During 1939 the wireless connections completed were: short-wave transmitters and receivers at Calcutta, Delhi, Jodhpur, Mumbai and Pune, medium wave equipment at Car Nicobar, medium wave and short wave receivers with remote control apparatus at the Aerodrome Control Buildings at Dum Dum (Calcutta), New Delhi and Karachi (d) construction of Adcock Direction Finding Stations at Gaya and Allahabad. The obsolete 5-kw Spark transmitter at the Mumbai radio and the 25kw long wave transmitter and receiver at the Madras Fort Radio were dismantled.9

On 1st July 1939, the existing Wireless Telegraph Divisions stationed in Mumbai and Calcutta were amalgamated with the Telegraph Engineering Divisions.

In the field of International Telecommunication, India played an important role. At Madrid in 1932, at Cairo in 1939, at Atlantic City in 1947 and at Paris in 1949, India was fully represented. The Madrid and Cairo conferences were administrative ones at which Telegraph, Telephone and Radio regulations were revised. India also became a signatory to the International Regulations.

At the Plenipotentiary Conference at the Atlantic City India was represented by a large and exclusively Indian delegation. This conference redesigned the structure of the International Telecommunication Union and brought into being the General Secretariat of the Union. It devised a new frequency allocation table to provide for new services, such as broadcasting, aeronautical and mobile service.
In 1947 short-wave wireless stations were opened at Srinagar, Jammu, Jullundur, Gauhati, Darjeeling, Agartala and Shillong.  

The saga of heroism in land and waves continued to be fascinating. Indian passenger ship Ramdas, owned by the Bombay steam Navigation Company became prey to heavy storm in July 1947. The sea consumed 500 men, women and children. But the news of the disaster reached hours later, when some of the more fortunate were picked up by passing boats. Ramdas was not equipped with wireless facilities. Often disasters inspire authorities to spend on technology.

Installation of Wireless Telegraph equipment meant not only the provision of costly equipment but also the appointment of specially trained wireless operators. The companies were loath to incur this expenditure for smaller ships. especially because such ships rarely went beyond the coastal ken. Exemptions from installing wireless facility were therefore, invariably granted to small ships. The Ramdas disaster, however, shook the country and it was immediately decided by the government not only to withdraw the exemptions but also to install a number of coastal wireless stations which would enable ships to communicate with the shore. Radio-telephone did not require the service of trained wireless telegraph operators.

The coastal stations were located at Ratnagiri, Karwa: and Mangalore. The Mangalore station started working in April 1949 and the other two by May 1950. In 1947 the Government of India formed the Civil Aviation Department. Wireless stations doing aviation duties were taken off from the Posts and Telegraphs and were placed under the Civil Aviation Department. Posts and Telegraphs was left with coastal services, meteorological services and aeronautical communication. From 1st November 1949 a revised rate of fare for different types of Wireless Licenses was brought into effect.
“The telegraph, even more than the railway, brought the new method of rapid communication. Starting a little over a hundred years ago with the telegraph, it has spread in many ways—the telephone, the wireless and lately, radar. Nothing has changed the world more during these hundred years than this astonishing change in our methods of communication. The telegraph was the first great step in this direction. Let us, therefore, honour the telegraph as the herald of the New Age.

A hundred years seem to be a long time and so perhaps they are. And yet, a hundred years is a moment in the earth’s long history and is a brief interval even in the recorded history of mankind. For tens of thousands of years, man’s only method of communication was either by runners or, perhaps, by swift horses. In the very early days a genius invented the wheel. For thousands of years it was the wheeled carriage that was the symbol of transport and communication, apart from the horse. No marked progress was made in this direction till the 19th Century was well on its way. Life changed in many ways during these thousands of years, but essentially it did not change. A person living two thousand years ago would have recognised the main features of human existence right up to the middle almost of the 19th Century.

Then came the great change heralded by the railway and the telegraph which has progressively altered the very texture of human life. Therefore, in celebrating a hundred years of the telegraph in India, we celebrate something that has been the essence of this new world that we live in and which changes continuously because of the progress in science and its application. If we are to understand this new world, we have to worship at the shrine of science, though that need not be our sole worship, for we require other things also to have a balanced and integrated view of life.”

Jawaharlal Nehru

*(Story of the Indian Telegraphs by Krishanlal Shridharani, pp vi)*
Accent on Asia

The highlight of activities during 1950 was the opening of the radio-telephone service to Indonesia—the first link with South East Asia. The direct radio-telephone was inaugurated on 2nd October, 1950. President Rajendra Prasad at the Indian side exchanged greetings with President Sukharno at the Indonesian end. Radio-telegraph messages handled by the departmental wireless stations for 1950-51 were 585,000. The number of Broadcast Receiving Licences issued during that period was 532,000.

The process of wireless expansion continued. On 15th March, 1951, communication between India and Thailand through Wireless Telephone was established. When Asian Games were held in India from 1st to 15th March, 1951, a direct Radio-telephone service between India and Japan was opened as a temporary measure. Another innovation was the Radio-Tele-Photo Service. This service to Japan was established on 3rd March, 1951 and was kept open till 15th March. During the two weeks 35 photos were transmitted.12

In the first Five-Year Plan, two schemes known as High-power-Wireless Link and Monitoring Scheme were mooted. These aimed at installing high power wireless stations at Delhi, Bombay, Madras and Calcutta for clearing inland traffic and for installing monitoring stations at Delhi, Nagpur, Calcutta, Bangalore and Bombay.

From PWD to P&T

Like the ocean that is made of tiny drops the P&T had a slow and uneasy start. The sprawling Post and Telegraph Department, for instance, occupied a small corner of the public Works Department in 1851. Dr. William O'Shaughnessy who pioneered telegraph and telephone in India belonged to the public works department all through the experimental stage. A regular, separate department was opened around 1854 when the telegraph facilities were thrown open to the public. The Telegraph Department during
1854-57 comprised a Superintendent of Telegraphs, with three Deputy Superintendents at Bombay, Madras and Pegu in Burma. There were Inspectors at Indore, Agra, Kanpur and Banaras and an operating and maintenance staff.

### Inmarsat Mobile Services

In 1992-93, the Earth Station (LES) at Arvi near Pune had the privilege of the highest holding time among all the Inmarsat LES all over the world. The capacity of Inmarsat “A” LES was augmented in November 1993 to incorporate new Inmarsat services - Inmarsat A.

The Inmarsat A system supports the portable satellite phone, telex, data, facsimile or photo services where the local network or terrestrial communications is unavailable or unreliable.

**Inmarsat C**

This is the world’s smallest and most portable commercial satellite communications system. A text only system, Inmarsat C operates at 600 b/s. It can be used for telex, electronic mail, etc.

**Inmarsat M&B**

VSNL has recently commissioned Inmarsat M & Inmarsat B services. These modern digitised versions for Inmarsat A will provide global communications using a small terminal (the size of a briefcase) for telephony and fax messaging. VSNL has pioneered these most advanced services in India.

**Inmarsat P**

VSNL is already an investor in the new affiliate company which will implement Inmarsat P services. Inmarsat P covers personal mobile satellite services which can be used from anywhere on the globe using a hand-held mobile terminal.

Source: Annual Report, Ministry of Communications, 1998

Dr. O’Shaughnessy was the first Superintendent of Electric Telegraphs in India and later become the first Director-General. The Indo-European Telegraph Department,
which later came to be known as the Overseas Communications, was administered by a Director-in-Chief whose headquarters was in London. On the 15th February, 1888, it was merged with the Director-General of the Indian Telegraph Department. It was decided that the administration reports of the two departments, Indian Telegraph and the Indo-European Department, should be separated so as to show how the finances of the country were affected by each unit.

The operations of the two separate services, Post Office and Telegraph Department developed side by side. On the eve of World War I, in 1914, the next big administrative change came. The Postal Department and the Telegraph Department were amalgamated under a single Director-General. The process had started in 1912, but it was completed in 1914. During 1923-24, 152 questions relating to the Department were asked and answered in the Indian Legislative Assembly. Posts and Telegraphs has always evoked a great deal of interest from law makers.13

A major reorganising of the department took place in April, 1925. The accounts of the Indian Posts and Telegraphs were re-constituted to examine the true fiscal profile of the department. The attempt was to find out the extent to which the department was imposing a burden on the taxpayers or bringing in revenue to the Exchequer, how far each of the four constituent branches of the department, the postal, telegraph, telephone and wireless were contributing towards this result. It was further examined whether the rates charged from the public for the various services were inadequate or excessive.

The Posts and Telegraphs, like all public and private undertakings, was a victim of the universal financial and economic depression which crashed on the world in 1930. During 1931, numerous economy measures had to be introduced according to the advice of the Posts and Telegraphs Sub-Committee to the Retrenchment Committee presided over by Sir Cowasjee Jehangir Jr. Naturally, the adoption of the various measures of retrenchment could not but have an adverse effect on the emoluments and interests of the personnel of the Department.
From the beginning the P&T was a set up run on welfare lines. Profit was not the motto. The annual report of the department for 1931 said “It is the accepted policy of the Government that the department should be so administered that there should be neither any substantial profit nor any substantial loss on its working under normal conditions. As has already been indicated the achievement of this ideal has not proved possible owing mainly to the exceptional economic and trade conditions of recent years. One of the main contributory causes was the revision and improvement of pay of the great bulk of the employees of the department in recent years. This was undertaken with the approval of and indeed under pressure by the Legislative Assembly.”

“While the department is commonly spoken of as a ‘commercial’ one and though as far as possible it is guided by the commercial considerations in the regulation of its business, it must be realised that in many directions it is debarred from observing strict business principles. Many of the purposes which it is required to serve are unremunerative and notably, in matters relating to the employment and control of staff, the department is bound by a large volume of statutory and other rules, doubtless necessary for the regulation of a public service, but which in the aggregate involve many restrictions of a kind unknown to private commercial concerns.”

After the implementation of the Federal Financial Integration Scheme of April 1, 1950, the administration of the entire network of Telegraph and telephone systems of the nation, including those that previously existed in the former princely states became a major adventure. In 1950 the number of Telephone Exchanges absorbed from princely states was 196. These systems which were working with different degrees of efficiency could fit into the general telecommunication network. The installed capacity of these 196 exchanges was 13,362 lines with 11,296 working connections. Soon after absorption an attempt was made to improve their technical efficiency by replacing obsolete and unserviceable equipment and lending well-qualified and experienced staff. Simultaneously, isolated exchanges were integrated with the general pool. The more
complicated task was acquisition of the staff. Their final absorption into the different cadres of service in Posts and Telegraphs was a major step.

From P&T to DoT

Till December 31, 1984, the postal, telegraph and telephone services were managed by the Post and Telegraphs Department. In January 1985, two separate Departments for the Posts and the Telecommunications were created. The accounts of the department initially maintained by the Accountant General of the P&T. However, by April 1972 the telecommunications accounts were separated. Simultaneously the department also started preparing the balance sheet annually. With the takeover of the accounts from the audit and delegation of larger financial powers to the field units, internal Financial Advisers were posted to all the circles and units.14

Department of Telecommunications

The Telecommunication Board consisted of the Secretary Telecommunications who was the Chairman and Member (Finance), Member (Operations), Member (Planning), Member (Personnel) and Member (Technology). This set up is now known as the Telecom Commission. The commission has Secretary (DoE) and Secretary (Finance) as its part time members. This was constituted in 1989. The commission other than the Chairman who is also the DoT Secretary, includes Member (Services), Member (Production), Member (Finance) and Member (Technology).

The Department in 1986 reorganised the Telecommunication Circles with the Secondary Switching Areas as basic units. This was implemented in a phased manner. Bombay and Delhi Telephones were separated to create the new entity called Mahanagar Telephone Nigam Ltd. (MTNL).
A MATTER OF FACT

As on 31st March 1951, there were 540 departmental exchanges with 102,156 direct lines and 18092 extensions. In addition, there were 33,908 connections from 3,033 private branch exchanges linked by junction lines. There were also 117 private exchanges with 2,875 telephones and 1,122 non-exchange systems with 8779 telephones. There were also 167 small licensed systems with 2,748 telephones. The total revenue due to telephone rentals, call fees, trunk call fees, recovery from guarantors and royalties from companies amounted to Rs. 89 million. The total number of trunk calls was 7,135,434.

Source: Story of the Indian Telegraphs by Krishna Shridharani, 1953

The telecommunication development of a country is best judged by the number of its telephones. On the 1st January, 1951, there were approximately about 74.8 million telephones in the entire world. Out of these, India had only about 160,000. United States had almost half of the total telephones all over the world. This was one reason for its international dominance in communication technology at the time.

In Australia, two cities, Melbourne and Sydney, had more telephones in 1952 than the whole of India. These cities are otherwise smaller than Bombay and Calcutta.

India's poor showing in the field of telephones at the time of freedom was as much a reflection of the state of the national economy as of its backwardness. Initially for the government postal department was the priority area. Yet it was the earnings of the telephones that made up for the loss of the posts. Universalisation of phone had a long way to go. Money was the main problem.\textsuperscript{15}
The Big City Picture on March 31, 1952

<table>
<thead>
<tr>
<th>City</th>
<th>Phones.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombay</td>
<td>46,181</td>
</tr>
<tr>
<td>Calcutta</td>
<td>35,794</td>
</tr>
<tr>
<td>Delhi</td>
<td>14,582</td>
</tr>
<tr>
<td>Madras</td>
<td>11,102</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>13,782</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>2,376</td>
</tr>
<tr>
<td>Bangalore</td>
<td>2,333</td>
</tr>
<tr>
<td>Lucknow</td>
<td>2,327</td>
</tr>
<tr>
<td>Kanpur</td>
<td>2,285</td>
</tr>
<tr>
<td>Nagpur</td>
<td>1,116</td>
</tr>
</tbody>
</table>

Source: Ibid

‘Own Your Telephone’

First major Telecom Campaign of Free India

The scheme was inaugurated in December 1949. Finances were a constraint for further spread of phones though the demand was growing. Under the guidance of Rafi Ahmed Kidwai, the first Communications Minister, a new scheme was introduced. Under the scheme a subscriber was required to pay Rs.2,500 in Bombay and Calcutta and Rs.2,000 in Kanpur, New Delhi, Madras and Ahmedabad. This deposit entitled him to a new telephone connection for twenty years. A nominal maintenance charge of Rs.2 per month and the call charges were his only additional liabilities. The scheme proved a big hit.

By July 31, 1952, the ‘Own Your Telephone’ collected Rs. 31 million. Under the scheme 13310 applicants were given fresh connections. Previously they had no chance as, government was short of cash to import new equipment. Their business suffered.
The initial investment, therefore, was taken with good grace. Five million rupees out of the earnings of the ‘Own Your Telephone’ scheme was invested in 1950 for telephone expansion.

Two more schemes were inaugurated soon. One was ‘Own Your Own Telephone Exchange’ whereby any place, mohalla, or a small town could have its exchange (50 lines) if at least 25 prospective subscribers were willing to pay Rs.2,000 each. The conditions attached to this scheme were the same as under ‘Own Your Telephone’ Scheme. The other one was the Telephone Loan scheme whereby bodies like Chamber of Commerce advanced a minimum of Rs. 50,000 to the government for 20 years at two to three per cent interest. This way the Department provided them with a small telephone exchange. Telephone was a luxury in free India. It was for long the preserve of the rich and business class.

Telephone density is a measure of the economic wealth of the community. The Telephone lag in India was for long attributed to the fact that the country is mostly rural and a majority of the population lived in villages. The telephone for long was considered an urban attribute. Till independence there had always been a brake on indigenous manufacture of equipment which would have been detrimental to overseas producers’ interests. Highly technical equipment like automatic telephones was one of them. With the end of that phase India stirred up to shake off the vestiges of slavery and the new slogan was swadeshi and self reliance. This had its impact on the communication industry as well.\textsuperscript{16}

Six miles from Bangalore, at Dooravani Nagar, the Indian Telephone Industries’ (ITI) was set up in 1952. It was able to design and develop the ‘Single Channel Carrier System’ used between trunk centres to increase the number of telephone circuits. The carrier system was previously being imported.
To begin with the factory produced 40,000 telephones annually. The first Five-Year Plan, envisaged a telephone exchange at every district headquarters and a Public Call Office at every thana headquarters. For many years after independence the non-availability of equipment was a bigger problem for meeting plan targets than the paucity of funds. However direct link with various European countries by radio telegraph and telephones was also achieved in the early years of the First Plan.¹⁷

**Plans and Missions**

One of the major steps during the First Plan period was establishment of a modern telecommunication manufacturing facility initially under the department and later as a public sector undertaking in the name of Indian Telephone Industry. The agenda was expansion of telegraph services deep into the rural areas, expansion of telephone services in urban, rural and backward areas, provision of long distance public telephones in rural areas, introduction of the telex service, subscribers trunk dialing within the country and internationally, use of new technologies in switching and transmission of data and facsimile services.

The First Five-Year Plan for telecom though small in size being just Rs. 480 million, provided the initial impetus towards crystallising the objectives of the telecommunication services. The Plan envisaged rehabilitation, automatisation and expansion of telephone exchanges in major cities like Calcutta, Bombay, Delhi, Madras, Kanpur, Ahmedabad and Pune, installation of 12 channel carrier system to interconnect major cities, beginning of trunk cable systems and installation of trunk exchanges. The opening of public call offices in all administrative headquarters towns and sub-divisional headquarters eventually to be extended to smaller units and rural area and setting up of indigenous manufacturing capacities for telephone cables at Rupnarianpur with collaboration of Standard Telephone and Cable Company of London were the other measures taken up. A teleprinter factory at Madras in collaboration with Olivetti of Italy, a factory to manufacture automatic exchanges and telephone instruments at
Bangalore in collaboration with Automatic Telephone and Electric Company of UK were the other plans. A modern training facility with a training centre at Jabalpur and at several other stations were other projects taken up.\textsuperscript{18}

The Indian Posts and Telegraphs is the world’s oldest government-owned public utility. This point has a special significance in India for, it had adopted a mixed economy and the ideal was a welfare state. The competence of ‘bureaucrats’ in running such vast enterprises is still being debated. The record of the Indian telecommunications, however inspire confidence in the ability of the state to supplement and complement private enterprise.

The plan outlay continuously rose from about Rs. 50 million in 1951-52 to Rs. 14000 million in 1987-88, an increase of 280 times. The number of telephone connections during this period increased from 82,985 to 3,487,908.

During the First Five-Year Plan the Strowger automatic exchanges were introduced on a large-scale all over the country. Third Plan witnessed the entry of Pentaconta Cross-Bar exchanges. During the Sixth Plan SPC Electronic Analogue Exchanges came, followed by the introduction of Digital Electronic Exchanges. In the transmission, 12-channel open wire systems in addition to the 3-channel and single channel open wire carrier systems were introduced during the First Plan itself. The long distance trunk cables, first a symmetrical type and later coaxial underground type, were brought in the beginning of the Second Five-Year Plan. This was followed by the introduction of the microwave system during the Third Five-Year Plan. The satellite communication system and the domestic satellite network were established beginning with the Annual Plan periods of 1979-80. All these immensely improved the communication set up in the country.\textsuperscript{18}

The telex service was introduced in India for the first time during the Third Plan and has been expanding ever since. Later fax and other more advanced systems came.
Subscriber trunk dialing was introduced on a point-to-point basis starting with the Kanpur–Lucknow route during the Second Five-Year Plan, which was later extended on a nation-wide basis through trunk automatic exchanges. This work started during 1966-69. In addition to the general expansion and opening of new services and technologies, the Department has developed strategies for extending the network into the interiors and rural areas through a series of innovative schemes. To begin with, public call offices and telegraph offices were proposed to be opened in places of administrative importance. It began with the district, sub-divisional and taluk headquarters, later extended to block headquarters. It was further expanded initially to villages of 5000 population in rural areas and 2500 population in backward, hilly and tribal areas. Then a scheme for public call office with telegraph facilities within five 5 km of every human habitation was taken up.19

FACT OF FIGURES

DoT provided 8.70 million new telephone connections during 8th Five Year Plan (1992-97) which is over 150% of the number of telephones existed in the country (5.81 million) at the beginning of the plan period. DoT proposes to add another 18.5 million telephone connections during the next five years from 1997-2002. In addition, it is expected that the private operators will provide 5.2 million telephone connections during this period, thus making telephone available on demand. These projections do not take into account the number of cellular phones which are also expected to go up from the present 750,000 to about 4 to 5 million by the end of 9th Plan.

Source: Economic Survey, 1997-98

Simultaneously, opening of telephone exchanges in rural areas for providing private connections was encouraged. First it was decided that such exchanges could be opened where there was a demand of minimum of 10 connections and the anticipated revenue would cover about 40% of the annual recurring expenditure. This was further liberalised in 1986, to opening of a telephone exchange with a demand of minimum of
10, irrespective of the revenue projections. For long phones in rural areas were highly subsidised. Most of the DoT revenue came from long distance calls.

Through these schemes the Department has sought to provide telephone connections to all those who need them wherever they may be and at the same time to extend the facilities of public call offices with trunk call and telegraph booking facilities within five km of the habitation.

Considerable success has been achieved in these objectives, though scarcity of funds has been a major constraint. The Department then worked on a perspective plan to ensure that telephone connections are available practically on demand by the year 2000 and that there was a public call office for every village as well as on every street corner in the cities and towns.20

Telecommunication sector for long for one reason or the other did not attract the attention of national planners for according high developmental priorities. For the first six successive plans, the outlay for this sector were insignificant. The change came only from the 7th plan onwards. The planners expressed the view, often recorded in the Planning Commission reports, “The Primary need of the people is food, water and shelter. Telephone development can wait.” And, “In place of doing any good, development of the telecommunication infrastructure has tended to intensify the migration of population from rural to urban areas. There is a need to curb growth of telecom infrastructure particularly in the urban areas.” (Approach paper sixth plan).

The ideology which then held sway over planning priorities made even a feeling get currency that telecommunication, in any case, has no role to play in rural economy. There was also a belief at the top level which was expressed in plan documents that telephone is a fad and a fancy. “Telecommunication is a consumer item particularly of the rich. At best, it deserves the same priority as five star hotels,” it was stated. This mindset underwent a change in the 7th plan and a fresh look at phones was taken.
# PLAN ALLOCATION

<table>
<thead>
<tr>
<th>Plan</th>
<th>Allocation (in Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Plan</td>
<td>Rs. 47 cr.</td>
</tr>
<tr>
<td>Second Plan</td>
<td>Rs. 66 cr.</td>
</tr>
<tr>
<td>Third Plan</td>
<td>Rs. 164 cr.</td>
</tr>
<tr>
<td>Annual Plan (1966-69)</td>
<td>Rs. 159 cr.</td>
</tr>
<tr>
<td>Fourth Plan</td>
<td>Rs. 415 cr.</td>
</tr>
<tr>
<td>Fifth Plan</td>
<td>Rs. 781 cr.</td>
</tr>
<tr>
<td>Annual Plan (1978-80)</td>
<td>Rs. 519 cr.</td>
</tr>
<tr>
<td>Sixth Plan</td>
<td>Rs. 2722 cr.</td>
</tr>
<tr>
<td>Seventh Plan</td>
<td>Rs. 4873 cr.</td>
</tr>
<tr>
<td>Eighth Plan</td>
<td>Rs. 23946 cr.</td>
</tr>
</tbody>
</table>

Source: Ibid

The Planning Commission recommended an outlay of Rs. 105700 million for telecommunication sector for the 7th plan for treating this sector as basic infrastructure for overall sound socio-economic development.

Much of the credit for this new approach should go to the then Prime Minister Rajiv Gandhi. He had a dedicated band of technology savvy advisers, who came to be known as whiz kids. With them at the helm the outlook changed. There was a fresh and modern approach to technology. However due to the resource crunch, Department was finally allotted only Rs. 40100 million (1984 prices) with the provision that borrowings from domestic market by way of bonds will be additional. The Department however drew up plans with tacit understanding with the Government for Rs. 60000 million. The broad objective of the 7th Plan was expansion to provide 1.6 million telephone connections to meet the long waiting list. It was planned to provide all the district headquarters in the country with national subscribers dialing network making available STD facilities with all the state capitals.
In all the four Metro Telephone Districts (Delhi, Calcutta, Bombay and Madras) and major Telephone Districts (Bangalore, Kanpur, Ahmedabad, Pune and Hyderabad) the demand registered up to June 1986 was to be cleared by the end of the Plan period. Similarly, in all the large exchanges with a capacity of 2000 lines and above registered demand was to be cleared up to April 87. Introduction of Land Mobile Telephone (Cellular Telephone Service) and Paging Service in four metro telephone districts was also planned.\textsuperscript{21}

Telex Services were proposed to be expanded to make Telex connections available on demand by the end of the Plan period. Introduction of digital microwave and optical fibre systems in a big way on the national and other arterial routes as well as to the junction networks of large cities was yet another breakthrough of this period. Among the big strides made during this time are modernisation of trunk automatic exchanges through introduction of Stored Programme Controlled (SPC) digital electronic exchanges, introduction of computers in a big way in the telecommunication network and management centres of the Department, provision of 15000 Long Distance Public Telephones in rural areas and introduction of new services like Videotex, Telex and Electronic Mail in major cities. Most of these services could actually be provided only during 8th plan. But the new awakening had its positive impact. The demand increased.\textsuperscript{22}

\textbf{‘Mission: Better Communications’}

During early 80s some improvement in service was brought about with the induction of electronic exchanges, both for local systems and trunk working, digital microwave, coaxial systems and optical fibre systems. Indira Gandhi as Prime Minister in the early seventies gave increased attention to performance of Telecom. But the real inspiration came in April 86, at the instance of Prime Minister Rajiv Gandhi. The
question of improving the telecommunication services was taken up as a National Mission known as "Mission: Better Communications."

It took off on a systematic way. Sam Pitroda heralded a new phase and he enjoyed the full support of the Prime Minister. The first activity of the Mission was to interact with representative sections of the customers and public to ascertain their views on the aspects of the services which needed immediate attention. It was noticed that the users were most concerned with the poor quality of telecommunication services and long delays in provision of telephone connections. Inadequate penetration of service in the rural and backward areas was another worry. For the first time the consumer interest became a top priority. The following main components of the Mission were identified. Improvement in the quality of service to the existing and prospective customers. Improvement in accessibility within the existing network. Concentrated attention to the indigenous development of certain selected technology and products and indigenisation of the equipment in the network.23

Another component of the mission was for provision of telephone on demand by the year 2000 AD. The various aspects of these Missions were included as a separate part in the Annual Action Plan of the Department to ensure better monitoring of these activities. A mid-term appraisal of the telecom Mission was completed in 1986. It was seen that very good progress had been made on all parameters. There was a significant improvement in the call success rate both for the local and STD. The telephone fault rate had come down considerably and the percentage of effective trunk calls put through was now over 80 per cent.

Rajiv Gandhi during his address to the telecom engineers in October 1987 observed "during these years, we have seen a commendable performance in the telecommunication sector as a whole. I would like to congratulate all our people involved right from the top to those at the grassroots level, right down to the linemen. I
believe that the success rate of STD calls has improved from 20 per cent in 1986 to about 70 per cent in 1987.”

While the activities of ‘Mission: Better Communications’ continued as previously planned, for the period from January, 1988 to March, 1990 attention was now focused on six Mini Missions to Improve Quality of Service. Increase Urban PCOs, Improve Delivery of Telegrams, Provide Telex on Demand, Improve Rural Communication, and Build up a National Digital Network.

**Mini Missions**

The Mini missions were further divided into micro missions indicating the time-bound programmes and milestones to be achieved by March, 1990. Under this Mini Mission an attempt was made to improve: staff response to the problems of the customers, difficulties in obtaining calls particularly STD and Trunk Calls, high incidence of faults on telephone and telex connections, difficulties in reaching the operator assisted services, especially Directory Enquiry Service, lack of credibility of telephone bills, particularly relating to STD calls were brought down to the minimum during this time.

Detailed action plans with time bound targets were drawn up for tackling these problems. Steps for motivating staff by special training, group and individual incentives, replacement of old and worn out equipment including telephone instruments and cables, inducting better switching and transmission equipment with modern technology like Digital Electronic Exchanges, Trunk Automatic Exchanges (TAXs) and Electronic Telex, Digital Microwave, Pulse Code Modulation (PCM) and Optical Fibres, computerisation of Trunk Exchanges and Directory Enquiry services and overhauling of outdoor plant were taken up in a big way. With about 3.8 million telephone connections, the waiting list in 1987 was 1.3 million. The average waiting period extended to about 4
to 5 years, while the waiting period in some individual cases was even more than 10 years.\textsuperscript{24}

More stress was, therefore, given to telephone accessibility rather than the telephone density. To help those, who need to use the telephone, but cannot get the same, the department proposed to improve accessibility through substantially increased Public Telephones booths. The objective was to increase the availability and reliability of public telephones.

During this period a quick expansion plan was taken up by opening telecom bureaux at busy locations in cities and opening banks of PCOs (Public Call Offices) at airports, railways stations and also PCOs manned by physically handicapped. The concept of PCOs as job opportunity for the poor and popularising “plugin” PCOs at market places were also the contribution of this mission.

A number of schemes like telephone PCOs for Credit Card Subscribers, Coin Collecting Local Call PCOs, Token Collecting STD Calls PCOs, Card Operated Local/STD call PCOs, Stand Alone Charge Indicator/Printer PCOs and Remote Location PCOs in peripheral areas of cities on cellular radio were encouraged during this period.

Mini Mission III was targeted to improve Delivery of Telegrams. The telegrams were often subjected to delays due to older technologies in use then. A sample survey carried out in April 1986 indicated that only about 30 per cent of the telegrams reached within 12 hours. As a first step, it was proposed to improve the delivery of telegrams in large cities and towns upto the level of taluka headquarters, so that the percentage of telegrams delivered between them substantially improved. Telegrams were targeted to be delivered within 12 hours. This had to be done by reducing the transit time for handling the telegrams at transit station, using micro processor based equipment namely, Store and Forward Message Switching System. To facilitate easy operation Electronic
Teleprinters and Electronic Key Boards were provided, replacing out dated Morse System.25

Mini Mission IV: Telex connections were mainly used by business and industry, who play an important role in the economic life of the country. It had become a very popular service. While it was not possible to give telephone on demand it was the endeavour of the department to provide telex on demand. To achieve this, provision was made for an additional 16,000 telex connections by installing large, medium and small capacity electronic telex exchanges depending on demand. Incidentally, this greatly improved the quality of telex service. In small places where about five applicants for telex were registered, this could be connected to the nearest telex exchange at no extra cost.

Mini Mission V: Rural communication was an important ingredient of this mission. The department gave priority for extending telecommunication facilities to rural areas and for this views were elicited at various levels. During the course of deliberations it was noted that the communication facilities in rural areas were inadequate and did not deploy the latest technologies. The communication facilities in rural areas were proposed to be provided in such a way that no person will have to travel more than five km to access telephone. The communication system had to be extremely reliable requiring the least possible maintenance effort. For the first time focus was set on providing telephone connections on demand.

The department accepted the recommendations of a study conducted by National Council for Applied Economic Research. The study identified about 50,000 inhabited hexagons of five km radius. All the hexagons were to be provided either with Long Distance Public Telephone or a telephone exchange. Efforts were made to cover as many hexagons as possible before 1990. To provide telephone connections in rural areas on demand, a new telephone exchange was to be opened in a village where a minimum of 10 applicants were registered. To ensure reliability of the interconnecting medium, the
Long Distance Public Telephones were linked to the parent exchanges through Multi Access Radio Relay Systems. Alongside, a large number of electronic exchanges were established in rural areas.26

Mini Mission VI concentrated on building up National Digital Network down to district headquarters. The estimated cost of all the Mini Missions upto 1990 was Rs. 23000 million which was made out of the normal annual plans of the Department of Telecommunication.

Between 1979 and 1989 the number of telephone connections grew at 8.4 per cent annually. The number of new telephone connections provided in 1991-92 was 735,000 direct exchange lines (DELS), 51.4 per cent more than in 1990-91. The four metros accounted for around 27.8 per cent. The number of people waiting for new connections on 31 March 1992 was 2.29 million, 16.6 per cent higher than a year earlier. The demand for telecommunication services has far outstripped the availability. The Eighth Plan had provided for reducing the waiting period by installing additional switching capacity of 9.3 million lines. This meant creation of 7.5 million new telephone connections.

Simultaneously an excess capacity had been built up in tele-instruments production, which was roughly three times the demand. Another area of concern was the scarcity of adequate number of switching equipment to keep pace with the accelerated rate of expansion. Total production of switching equipment (strowger, crossbar and electronic switches) by the Indian Telephone Industries (ITI) during 1991-92 was 1.1 million lines, 16.1 per cent higher than in 1990-91.

This sector is now open to private investment. Joint venture companies are now manufacturing electronic switches. With this initiative, it has been possible to meet the Eighth Plan demand for additional switching capacity through domestic production.
The increase in telex switching capacity during 1991-92 was 2006 lines, 7.6 per cent higher than in 1990-91, 1795 telex connections were added, 16.7 per cent lesser than in 1990-91. Demand for Telex connections declined because of increased use of FAX.

The outlay for the telecommunication sector in the Eighth Plan was Rs. 251.37 billion. During 1991-92, Plan expenditure was Rs. 35470 million, of which 71.5 per cent was financed through internal resources. For 1992-93, the Plan outlay was Rs. 45000 million. Of this, 65.3 per cent was financed through internal resources. With restricted budgetary support and limited options of market borrowings the government decided to go for private participation in telecom development.

The annual growth rate of telephone connections has been increasing steadily from 9.8 per cent in 1988-89 to 17 per cent in 1992-93. During 1993-94, this reached 18.3 per cent. The number of new connections provided in 1993-94 was 1.2 million. The number of people waiting for new connections as on March 31, 1994 was 2.5 million, 12.3 per cent lower than the number in the previous year. The DoT has taken up the challenge of providing public telephones in all villages. During 1993-94, the villages which received telephone connection were 33,001. This was 9.7 per cent more than that achieved in 1992-93. A total of 345,000 public telephones were provided by April 1997. Another 139,000 public telephones were added between 1997-98 and by the beginning of the ninth plan the average number of PCOs has become one for 500 persons in urban areas which equals the target set for in the National Telecom Policy. During the eighth plan 8.7 million telephones were added which was more than 150 per cent of the number of telephones that existed at the beginning of the plan on April 1, 1992. The demand projections made on the basis of actual demand for 1991-97 indicate an average growth rate of 16.5 per cent. Based on this growth rate the demand for the next 10 years would work out to 81.8 million telephones requiring an addition of 67.4 million lines, says a DoT study. \(^{27}\)
Communication Architecture

Building and Architecture initially had hardly any special planning except to create imposing structures which had the prevailing influence of Mughal and European Architecture. The Central Telegraph Office (CTO), Hutatma Chowk, Bombay amply displays the architecture of the departmental buildings of those days.

After independence significant improvements have been made in the telecommunications building technology. The type of buildings which accommodate the new systems are quite diverse and complex. There are now telephone exchange buildings housing microwave, coaxial and satellite stations, CTOs, telecom factories, telecom training centres, telecom stores, depots and workshops, administrative buildings and residential colonies for staff.

The majesty and beauty clothed into the design and construction of these buildings had to match the changing technology of the telecommunications systems. It had its own constraints in terms of technology and the requirements of the surroundings.

Cable ducting for instance was planned to terminate in the cable chamber; at times requiring basement floors in one or two levels below ground. This cable system thereafter leads to the Main Distribution Frame.

The functional relationship called for definite co-ordination between MDF room, power and battery and the switch rooms. The building and architecture department of DoT had to plan in advance to organise space for sub-stations, generators and air conditioning rooms. Loading pattern of technical rooms need adoption of special structural modules. Besides these peculiarities, the non-availability of land area in the cities had made it necessary to go in for multi-storeyed buildings. These buildings need specialised designs to withstand fire, natural calamities like earthquakes and storm and the vagaries nature like humidity and pollution. The DoT on an average spends Rs 6000 million annually on land and buildings all over India.
In the 40's the building requirement for the DoT was primarily for Telegraph offices which had no technical requirement. The departmental Telephone Exchange Buildings were then designed and constructed by the CPWD. With the adoption of new technology in the 60s the department went for inhouse architects and engineers for designing and building telephone exchanges. Thus started the P&T Building Works Service (PTBWS) in 1965. During the last four decades, a large number of telecom buildings have been constructed by PTBWS. The DoT today has a chain of well-designed buildings all over the country.

Though the design of telecom buildings is primarily governed by the technical requirements, their architecture and imposing style have made them landmarks in most cities.

**National Telecom Museum**

History is a process of selection in terms of historical significance, simply to show how it really was, said E H Carr in *What Is History*. Well, the DoT too has in its own way tried to recreate history for posterity. In an effort which is extremely impressive in depiction and content, the National Telecom Museum, Bhopal has brought together 150 years of evolution in communication. It has antique and historical documents, photographs and pictures, static and dynamic models and live equipment.

A great variety of equipment which were supposed to be of state-of-art in their times were displaced gradually making way for next generation of instruments. The museum thus created, is not only of great educational value to the students of history of telecommunications but is also a window through which the future generations can peep into the efforts made by their forefathers.
This museum exhibits many invaluable items like Highton's tick galvanometer, Baudot's machine, VF - VF Repeater and old telephone instruments. The collection belongs to the period between 1835 and 1997.

This museum also possess a very rich collection of old teleprinter machines of creed make (1933 vintage), open wire carrier systems of value type (pre-1950 vintage) etc. There are also a large number of manual trunk exchanges. Strouger exchanges of various types and model crossbar exchange. All these equipment are in working conditions. An effort has been made to give a vintage look to the Museum by using furniture, mostly of cast iron of intricate designs, which were used in the telegraph offices at the turn of 20th century.

The Indian P & T Department is the second largest aggregate of public utilities in India. It is thus a unit of the Government of India which employs the second largest number of Indian citizens. International experts have admitted that India's is one of the most difficult terrain in the world for the construction of communication lines. We have to scale the snows of the Himalayas—we maintain the highest line in the world at Khambajoing in Sikkim. Our officers and men penetrated the dense tropical jungles of Assam and Burma, often acting as soldiers in self-defense against hostile tribes and wild animals and venomous reptiles. Some of them died in the line of their duty. Vast areas in Assam, Orissa, Madhya Pradesh and Himachal Pradesh still remain to be connected with telegraph lines. These are difficult and impassable in jungle and hill areas. But our brave men are engaged in linking these areas with the rest of the world.

JAGJIVAN RAM

Source: Story of the Indian Telegraphs, pp xiv
References:

1. Memorandum for Telecom Commission “Review Of The Cadre Restructuring Scheme In The Department Of Telecommunications” (Dept. of Telecommunications No. 15-6/96-TE.II dated November, 97)
2. Memorandum For Telecom Commission (Creation of an Organisation for “Marketing” in the field units and Headquarters of Department of Telecom, October 28, 1996)
4. ALLTC – A Brief History, 1975
5. Telecom Commission, T-2 section dt. February 6, 1998
6. The Internet And Global Trend, by Herold Wolhandler, Director of Research, Active Media, Inc. dt. October 16, 1997 (Backgrounder)
7. VSNL communicates with customers (August 2, 1997)
8. Videsh Sanchar Nigam Limited (VSNL) Shri B.K. Syngal, Chairman and Managing Directors (speech at the 11th annual General Meeting Company September 27, 1997)
12. Telecom Policy: Rushing in where angles fear to tread, Economic and Political weekly, August 13, 1994)

15. Report of 11th Annual General Meeting at VSNL dt. September 27, 1997 (1997-98 begins on an extremely optimistic note with a 28% increase in traffic volumes in the first five months)


17. DoT's Data Communication services in India 1997 (DoT started video conferencing But there were no takers)


19. Performance Reviews, Modernisation of Telegraph services, 1998

20. Migration of existing licenses of Cellular, Basic and Value Added Telecom Services to New Telecom Policy-99 regime. DoT Note

21. The new Telecom Policy '99 is going to be in place soon. It has a provision for migration of existing licences in basic and cellular into a revenue sharing arrangement with DoT

22. Sukh Ram's diary holds the key. E.T. 20.8.96


24. Answers to the Questionnaire from Standing Committee of the Parliament on Communications – Examination of “Expansion of Telephone Network including selection of Multi Access Relay Radio (MARR) and other contemporary technologies, July 27, 1988

25. Memorandum For The Consideration Of Full Telecom Commission “Current Status of issues raised by Basic Telephone Service operators: dt. April 11, 1997 Dept. of Telecommunications, Sanchar Bhawan, New Delhi-110 001

26. Basic Telephone Services: Rajya Sabha starred question No. 13 for 20.11.96

27. Telecom Commission, note on Issues relating to:
   i) change in effective date of licence and
grant of extension of time for delivery of service without liquidated damages; in respect of Cellular Mobile Telephone Services in Telecom Circles (April 15, 1997)