CASE STUDY

INTRODUCTION

What constitutes information technology has been widely discussed in the beginning of this chapter, hence the definitional aspect of information technology has been avoided here in order to minimise repetition.

IN THIS CASE STUDY

![Diagram of Information Technology Components]

**FIG - 1**
Main Constituents of Information Technology:


Since, the time immemorial the concept of information is constantly involved in shaping the course of the human civilization. But, by the late 60s and early 70s a new phenomena was witnessed in the developed countries
where the conscience of every informed and enlightened individuals was focused towards the development which took them by surprise. It was basically focused in the area of such invention and discoveries which they never have thought in their slightest subconscious stage that it will become a reality one day. This development was nothing but the emergence of micro electronics and computer.

![Diagram of technology segments](image)

**Fig - II**

*Interconnection between the various segments of Information Technology*


This phenomena characterizes the third technological revolution in the industrially developed nation. The actual emphasis of the current technological revolution lies in the ability to generate and process information. This information could be of any kind. Since, the outcome of this technological revolution is process oriented, hence its effects all are pervasive, cutting across the entire realm of humanity.\(^1\) One of the area as processing information is "microelectronic". For example the application of microelectronic to generate

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information, lies in the miniaturized circuit computers. These processes are accomplished very fast ie greater speed and accuracy and at the same time these are more powerful and less costly. One of the area which greatly require the help of the technologies is the area of telecommunications etc. Since these technology have tremendous capability to increase India's productivity both qualitatively and quantitativity. Hence India desperately needs the service of these technologies in the manufacturing, agriculture and especially in the "service sector".

Now, since there is a need for these technologies in the initial areas of our economy for growth, there is an argument that judicious import of these technology is require and not just an indiscreet import of it; because, then, it will generate the conditions of dependency in the longrun.

Since, this third revolution in the field of technology has occurred in the developed countries, to get them transferred to the developing countries is a very difficult task. It needs the application of an interplay of accurate and judicious wisdom filled diplomatic manoeuvrings. The negotiations which can bring in technology is the hallmark of the entire discussion.

So far, India, has succeeded in achieving some benefits out of its concerted efforts and hectic diplomatic negotiations merely because of the situation it has been put into. It has been branded as the hegemonic power in the south asian region with less value for the protection of the intellectual

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4 ibid.
property rights of the donor country in terms of technology transfers, on the issue of royalty etc. Also the arrogance of India in not signing the NPT, CTBT, not coping with MTCR. Its opposition to certain decisions on TRIMS, GATT and WTO has put India into a position of tight spot. U.S. finds India defaulter in the above case, hence a highly sensitive country on the issue of military and national security, it has found India as the country when checks has to be applied more than to balance it. This calls for the job of the Indian negotiators to apply themselves to their best to get whatever is available from these countries including US. But at times the negotiations has basically put us down; either, mainly due to the fault at policy level and sometimes at the lack of the application of proper diplomatic methods and manoeuvring. It is said that, at times it lacks clear planning. The snags in our foreign policy and diplomatic thinking and faulty strategy comes as hurdles in the way.

But whatever may be the case, one thing is clear, increase of the inherent contradictions among the developed countries and the existence of cut-throat competition existing within them, the compulsions of need to survive has once again forced them to the old technique of lookout for foreign market this incraft constitutes the highest stage of capitalism which Lenin emphasised in his epoch making theory. "Imperialism the highest stage of capitalism". Thus, certain modified version of the same is existing today, hence India having a vast

5 Hindu, (Madras), 19 Jan., 1996.
6 Hindu, (Madras), 10 Feb., 1996.
7 National Herald, (New Delhi), 14 September, 1996.
potential and a highly complicated middle-class market has emerged as the greatest market for the developed capitalist countries especially U.S.\(^9\)

The present, society in which we are living today is branded as "Global Information Society", which has created new economic, social and political order and on top of it, it has also created a global middle class which shares similar notion of economic progress and has a common concept of human rights. These developments have led to the emergence of the concept of "Transnational Economy" and "Transnational Market" i.e. "Global Economy and Global Market".\(^{10}\)

Because, of these above conditions, even if India faults at certain level, U.S. would concede to the Indian requirements so long India opens its market to it. Now, how much and how long this happens is an enigma, that remains to be solved. The only consolation is, the example of China. That, because of excess U.S. investment in China, the U.S. businesses houses cannot leave China alone by imposing trade sanctions and not allowing MFN status,\(^{11}\) because of its attitude on Taiwan, its case of human rights etc. The reason being the Chinese markets are to be available to the US investors and commercial houses etc. So, India having an equal potential in the market terms, cannot be left behind, and the concept of Super 301 etc. (the methods of arm twisting by U.S) is nothing but preliminary exercises of threatening. Let it be assumed that, despite the hankering by U.S. on the issues of IPR, MTCR, CTBT; NPT,

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11 Times of India, (New Delhi), 12 June, 1996.
TRIMS etc, the U.S. is ultimately going to be silent on India in case of technology transfer. Unless they want to lose the vast Indian middle class market and the possibility of being taken over by the U.S. competitors (viz. Japan, Germany and Italy) the moment U.S. leaves.\(^{12}\)

What matters and the real issue is (to be noted is) the role of our diplomats, the policy makers and implementors. The kind of negotiating strategy they adopt for India for getting full flow of high-tech would be important. In all counts and in the end, it will be India which will emerge as a gainer.

No doubt certain policy formulation has to be required. Towards this effect India has adopted right after 1991 the Industrial policy which based upon the mechanism of liberalisation process of the economy. The policy would enable the government of India to create a proper atmosphere for hi-tech imports as well as develop its own R&D base. India has opened up and towards this aspect India is also pursuing a vigorous diplomatic negotiation to gain free untied technology transfer.\(^{13}\) For example the telecom and information technology negotiations at WTO. Though some signs of achievement have emerged but the magnitude is not very encouraging. It will be too early to expect more also. Though, the process had started with a positive note the end will determine the outcome of the procedures adopted by the end of the day.

Yet, some inference can be drawn from the above (are as follows) firstly the liberalisation of Indian economy is going to stay no matter what

\(^{12}\) Hindu, (Madras), 19 January, 1996.
government comes to power. Secondly, due to unstable political environment, the foreign investors and MNC are watching the scenario for investment very carefully. Thirdly - India non compliance with the CTBT (recently), MTCR and NPT along with defiance to other issues, the foreign investors and developed countries viz. U.S. are suspicious with the intention of India.\textsuperscript{14}

Further, by joining the Information Technology Agreement (ITA) signed during the Ministerial meeting of World Trade Organisation (WTO) held in Singapore during December 1996, India has become a part of Global Telecom revolution taking place in the IT industry. International trade in IT products is currently valued at over US $ 500 billion and it is expected that in the next century the information technology sector will be the largest industry in the world and provide the foundation upon which most of the industries will be built.\textsuperscript{15}

By joining the ITA India will be able to attract foreign investment especially from US in this crucial sector. Easy access to information technology at the most economical prices would help to modernise and to improve the competitiveness of the Indian Industry across the board as well as international border.\textsuperscript{16}

Also, because of the WTO & ITA agreement the flow of technology from US to India will be smoothened though, it's general complaints towards the IPR violation will continue to be a major hurdle.

\textsuperscript{14} Hindustan Times, (New Delhi), 15 February, 1997.  
\textsuperscript{15} FICCI, Seminar report on WTO & IT agreement, 1997, p.10-11.  
\textsuperscript{16} ibid.
Thus for a proper and fruitful diplomatic negotiations the above factors becomes the biggest barriers.

Since the area of the information technology is vast, yet for the sake of a proper case study to highlight the role of negotiations in the transfer of information technology, we have taken two major areas which very much constitute the prime sectors of information technology viz -

(a) Telecommunication

(b) Computers.

Case Studies

IN THIS CASE STUDY

Main Constituents of Information Technology:
CHAPTER IV
NEGOTIATING HIGH TECH TRANSFERS IN
TELECOMMUNICATION

(CASE STUDY - A)

General Description:

Telecommunications Technology

Telecommunication Service Sector

AT&T ALLOCATEL Pvt Indian Telecomm Firms

Privatised Sector

Govt. Undertaking

Private, MNC Allowed after Liberalisation Process, with MNC 51% equity Participation and Delicensing.

Telecommunication Component Sector

Public Sector Units. Due to faulty planning and policies with deficient R&D investment. Therefore Looking for Collaboration & Joint Ventures

MTNL VSNL

Fig - III

Telecommunications Scenario in India


Importance of telecommunication has been on the increase over the years, especially with the advent of micro-electronic technology and the introduction of computer controlled telecommunications systems. With the introduction of the digital transmission and more recently, of digital switching, there has been a dramatic increase in the importance that governments attach to having a modern telecommunications system in India. This can be achieved
by having a modern telecommunications evolution system either through purchasing these systems or actual involvement in the technology. Because this is considered as essential towards development of technological base in India. Further impetus has been given to this trend by the expectation that the future telecommunications network (narrowband and broadband ISDN) will be the foundation for the so called 'information age'.

The potential for growth in the global information and communications sectors is enormous. The current world market for telecom is estimated at US $513 billion and if we consider the entire information technology as a market, that will come to about US $1.3 trillion. Opportunities in the Information Technology (IT) sector have been growing rapidly all over the world. According to the International Telecom Union (ITU) Report 1995, the information communications sector is growing at almost twice the rate of the rest of the economy. In 1994, the growth accelerated to unprecedented levels. The basic telephone growth rate was 13% in Asia alone. To exploit the emerging huge market, different countries are restructuring their IT sector. The European Union (EU) have already set January 1998 bas the deadline for opening up of their continental telecom market. The mid 1996 Geneva Conference, which was attended by about 31 countries with EU represented as

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3. ibid n 12
4.
one country, is also planning to fix the deadline for liberalisation of telecom sector under GATT.\textsuperscript{5}

The Global Telecom Pact, signed during the Meeting of World Trade Organisation (WTO) held in Geneva on 15 February 1997, has brought together the 68 countries, which account for about 93\% of global trade in this fast growing sector. The pact provides for cutting tariffs on computing and telecom equipment in four stages to `zero' level by 2000 AD apart from other major issues. Some of the countries have supported the agreement in principle but have not signed it on account of some minor points/matters.\textsuperscript{6}

There are five elements which reinforce the basic propensity of telecommunication to be internationalised.\textsuperscript{7} The first is the driving force of technology. Initially, wireless and wireless technologies were developed simultaneously but wireless became dominant. In recent years, we have seen the phenomenal development of wireless technology thanks to the development of digital and satellite technologies.\textsuperscript{8} The launching of geo stationary and low earth orbit satellites has given a tremendous boost to global telecommunication.\textsuperscript{9} Projects like that of IRIDIUM of Motorola\textsuperscript{10} are aiming at the ultimate

\textsuperscript{5} ibid., n.2, p.33.
\textsuperscript{7} FICCI, Tassk forces Report, on Telecommunication and Information Technology, July, 1997.
\textsuperscript{9} ibid., n.7, p.4.
\textsuperscript{10} Telemetics India, 1997, March, p.35.
mobility in telecommunication where with a single telephone number one can move about anywhere in the world and communicate.\textsuperscript{11}

The second element of the international dimension of telecommunication is the pressure of global trade. Telecommunication has made the world a global village and has spelt the death of distance. This had helped the growth of global trade. As global trade has grown, ther has been a tremendous change in the manner in which it has been conducted. For such competitiveness in the global market, telecommunication is vital. Telecommunication is one of the important infrastructure for any country which aspires to be a player in the global market today.\textsuperscript{12}

The third element enforcing the international thrust is the tremendous competition in global trade which is increasingly dependent on time. In time-based competition information technology is vital. Information technology is nothing but the synthesis of computers and telecommunication. Perhaps there is no area of manufacturing or services where one cannot use information technology to improve productivity and profit.\textsuperscript{13} This global dimension of information technology which in its own way had also contributed to outsourcing of jobs from developing countries to developed countries is the third factor that makes telecommunication more and more international.\textsuperscript{14}

\begin{flushleft}
\textsuperscript{11} ibid., n.7, p.5.
\textsuperscript{12} ibid., n.1, p.15.
\end{flushleft}
The fourth element is the aspect of ideology. So long as the world was divided between centrally planned economies led by the communist block and the market friendly system led by the United States and Western Europe, there was also a greater control over telecommunication from the national point of view.\(^{15}\) But, now, with the collapse of the Soviet Union and the end of the cold war, more countries are moving towards a market driven economic paradigm.\(^{16}\) This in turn means that regions are becoming even more important than national boundaries, according to observers like Kenichi Omahe.\(^{17}\) In this context therefore, the GATT agreement which can be seen as a further boost to the strengthening of the international diplomatic process for greater global trade has naturally led to a situation where international agreements on opening up the borders in telecommunication has also become a logical necessity. It is interesting that after the signing of the GATT agreement, two of the earliest agreements that have been signed under the new framework are the one relating to the February 1997 agreement in Geneva on global telecommunication and another related to the information technology signed in March 1997 aiming to bring down the tariff to zero level by 2005.\(^{18}\)

The fifth element in the international dimension of telecommunication is the interest of the developed countries to find markets for their technologies in telecommunication and also the increasing awareness of the customers about the choices they can have in telecom services in the developing countries like

\(^{15}\) ibid., n.7, p.5.


\(^{17}\) ibid., n.7, p.9.

\(^{18}\) ibid.
India.\textsuperscript{19} This could be viewed as a market driven force contributing to the international dimension of telecommunications.\textsuperscript{20}

As mentioned earlier, the growth of telecommunication in any country depends on four engines. These are (a) technology, (b) political will, (c) regulation in judicial activism and (d) market dynamism. In India we have the telecommunication sector coming alive after a monopoly of more than a century, thanks to the U-turn in economic policy made by the government in 1991. The 1994 telecom policy articulated the political will of the government so far as this sector is concerned.\textsuperscript{21} With the setting up of the Telecommunication Regulatory Authority of India (TRAI), we will hopefully see the greater play of the regulatory forces and judicial activism.\textsuperscript{22} These will create the requisite environment for market dynamism which ultimately is going to benefit the consumer on the one hand and the Indian industry to compete effectively both in the domestic market as well as in the global market. One factor to be noted in telecom which is also true to a continuous fall in prices which makes the customer very happy and makes the competition more vigorous.\textsuperscript{23}

**TELECOMMUNICATION: General Description**

**Backgrounder:** Telecommunications is a national resource. It is a complex segment which links international with the national, development, its

\textsuperscript{19} M.R. Bhagavan, "Technological Implications of Structural Adjustment; Case of India", *EPW*, 18 February, 1995.

\textsuperscript{20} ibid.

\textsuperscript{21} ibid., n.7, p.16.

\textsuperscript{22} Times of India, (New Delhi), May 1997.
operational and service sector and covers entire aspects which affects industry, agriculture, transport, etc. Transportation and communication services are complimentary, but communication is less energy intensive and ideal for development of India.  

Telecom has become one of the most critical segments of our economy. Rapid growth of industries and services need a greater degree of support of telecom technology. Telecom services can help in the integration of rural economy with the other segments rapidly.

Worldwide (for about 5.0 billion people), there are about 500 million telephones (10 telephones per 100 people), of which 80 percent are in the advanced countries. 100-odd developing countries have less than 40 million telephones in operations. Telecom equipment market worldwide is estimated to be over 100 billion US $ per year and its growing at a rate of about 10 percent annually. Telecom market is dominated by a small number of multinational companies. Forty percent of the telecom market consists of switching equipment. Switching equipment technology capability building is vital for long term and strategic point of view for India's growth and export potential.

25 ibid.
27 ibid.
28 Electronics Information & Planning (Electronics Commission, New Delhi), February 1991, p.223.)
Information technology industry is one of the rapidly growing segment in International Trade GATT has reported that computers, integrated circuits and telecom equipment are the three topmost categories which have been identified as dynamic products in world merchandise trade during 1979-87 period.29 The three categories account for 159 billion U.S. $ for ten percent of the manufactured exports in value terms.

Apart from this, globalization trends of industries, European Unification\(^30\) in 1992, liberalisation of Eastern European Economies, emergence of networking among European partners,\(^31\) make telecommunication a very important sector of growth. These are the inputs on which hang the international relations factors linking up with telecom.

Telecommunication, a highly dynamic sector, is undergoing rapid and profound structural change of great magnitude. This sector is showing an economic growth rate which few others can match. The changes taking place in the telecom area can be summarized as follows.\(^32\)

a. A large number of products and services are being introduced, constantly expanding the market.

b. Several of these products and services are being introduce, constantly expanding the market;

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c. As a result of the increasing convergence of telecom and computer technologies (as already evidenced), there is a strong tendency towards integration in terms of acquisitions, joint ventures, collaborations between telecom, computer, semi-conductor and software firms.

d. Telecom industry is a part of the information industry as shown in figure II, and in most countries this is identified as a strategic industry not only because of the size of its output, but also because of its potential effects on other sectors of the economy.

Telecom is part of the new emerging information communications technology paradigm. Some of the characteristics of this technology cluster are:

a. The time between design prototype trial and commercial production is coming down;

b. Technical information is highly proprietary and it is not easily available (refer IPR);

c. The technologies are multidisciplinary and skills for developing them are not easily available in developing countries. This is, of course, not the case in India;

d. Commercial and technical information needed for these new technologies cannot be clearly demarcated.

These characteristics make it difficult for developing countries to master these new technologies quickly. Finally, telecom equipment technology has a high R&D intensity;

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34 ibid., p.223.
Telecommunication Project Categories:36

- Public switching systems and networks.
- Public transmission, systems, further subdivided into transmission over metallic cable (pair cable, coaxial cable), transmission over fibre-optic cable, terrestrial microwave transmission systems and satellite microwave networks consisting of satellite equipment and earth stations;
- Cable projects, such as the installation of subscriber cable networks, local junction networks, long-haul routes, and submarines cables.
- Public data networks, including circuit-switched, packet switched and telex networks;
- Mobile radio telephone networks (cellular radio).
- Rural communications networks;
- Projects similar to those above but for public utilities or private organisations such as railroads, government authorities, and banks. These special purpose networks may be based on modern PABX systems rather than public switches;
- Supply of telephone subsets and coin boxes, as well as telex, facsimile and other types of terminals, many projects also involve the construction of buildings, access roads, antenna towers, and so on.37

35 R&D Score Board, Business Week, (Bombay) 14 August, 1989.
37 ibid., p.656.
Specifications for telecommunications involving technology transfer are generally issued by public telephone administrations, government authorities, or large private organisations.\(^\text{38}\) In addition to a section describing the requirement for direct supply of equipment by the original supplier (technology provider), the specification will include a section that details the type of know-how transfer expected.\(^\text{39}\) The manufacturing or service organisation which will be used for the future production or service activity may be an existing company in the host country which will act as a licensee, or a new company (a joint venture company or a subsidiary of the original company). In the case of a joint venture, both the technology provider and the receiving organisation may have significant equity and capital in the venture.\(^\text{40}\)

Typical activities in the production of the modern telecommunication systems are basically divided into three main categories:

1. **Manufacturing** of: a) equipment cabinets, racks and subracks; b) plastic subset and other terminal housing antennas and waveguide parts; c) printed boards, backplanes and interconnection cables.
2. **Assembly**: a) components and associated soldering into printed boards; b) wire-wrapping, and cabling of complete equipment cabinets.
3. **Equipment** testing at various levels (i.e. a components printed boards, subtracks, subsystems, entire systems).\(^\text{41}\)

\(^{38}\) ibid., p.657.
\(^{39}\) ibid., p.657.
\(^{40}\) ibid., p.657.
\(^{41}\) ibid.
The manufacturing process may start at a more fundamental level if certain basic components are produced by the equipment supplier. Examples are the production of custom designed LSI chips, optical instruments, keyboards, display units, connectors and fibre optics, metallic and submarine cables.\textsuperscript{42}

In parallel with this hierarchy of manufacturing levels, there exists a range of engineering activities:

1. Research and development, including system design (hardware, software) and the design of custom LSI circuits:

2. Systems engineering, including customer adaptation and application engineering and network planning.

3. Design of software supports and tools used for equipment design, engineering and testing.\textsuperscript{43}

Levels of Technology Transfers in Telecommunications

By the very nature of telecommunications projects, they always include at least some minimum level of technology transfer, even if no actual manufacturing is involved. Of all the categories of telecommunication projects listed earlier, public switching networks are the most complex, other projects are in general more straightforward.

One of several of the following levels of technology may be considered for transfer:\textsuperscript{44}

\textsuperscript{42} ibid.

\textsuperscript{43} ibid.

1) exchange/network operations and maintenance;

2) exchange installation and testing;

3) repair of defective units;

4) exchange of software technology; and

5) switching equipment manufacturing.

The manufacturing of switching equipment is generally handled by a separate company. Installation, testing and exchange software activities could be handled by either or even split between the two.\(^45\)

Exchange of software technology includes a hierarchy of activities of increasing complexity, so the extent to which a technology receiver should get involved the related function needs to be fully evaluated. The following levels of software technology may be distinguished.

1. Exchange database administration.

2. Exchange database and generic programme production.

3. Generic programme design; and

4. Software support tools development.\(^46\)

In most cases, the first activity will be handled by the government. Depending on the size of the network and the rate at which it is expanding, and given that the government wants to handle exchange installation and testing, it might also handle the second activity. However, if the system is being

\(^{45}\) ibid., p.658

\(^{46}\) ibid., p.658.
manufactured locally, the second item would normally be handled by the local company.\footnote{ibid.}

The third and fourth items required substantial investment in equipment and skilled personnel. It will take several years after the initial technology transfer before any administration or local manufacturing company should seriously consider becoming involved in either of these complex areas.\footnote{ibid.}

With respect to switching equipment manufacturing, the labour content is rather low as it effectively consists of assembly and testing of equipment.

It is also necessary to take into account that worldwide, the traditional telecommunication suppliers have been facing similar problems. The increasingly strong competition to achieve an increased share of the market and the consequent larger production volumes is causing the present upheaval in the telecommunications industry.

Apart from switching equipment, sophisticated computer terminals connected to the telecommunications network are now used extensively in businesses.\footnote{ibid.} The variety is increasing, driven by cheap electronic devices, including even microprocessors, which have given the terminals more logic and memory. A significant trend is the inclusion of increasing intelligence in terminal equipment. The net result is functionality and quality.\footnote{ibid., p.27.}

\textsuperscript{47} ibid.
\textsuperscript{48} ibid.
\textsuperscript{50} ibid., p.27.
As far as transmission is concerned, there are two principle types: analog and digital. Graham Bell's invention was, in essence, the discovery of analog transmission, and over the course of the next century, analog voice band took over the communications world.\textsuperscript{51}

There are, however, significant advantages in digital transmission in that in-signal degradation is easier to overcome. There is greater flexibility, greater information handling capacity and cost competitive with analog transmission.\textsuperscript{52}

Apart from the above, signaling, data services, voice services and some specialized services form the ambit of telecommunications networking.  

**New Trends in the Technology**

One of the major technological break-through has come about in microelectronics, the world of tiny chips of semiconductor materials, principally silicon, containing a multitude of components through which electrons race to perform complex logical functions at high speeds. These densely packed chips perform complex logical tasks, operate much faster and are cost effective.\textsuperscript{53} Fundamental physical limits are not likely to limit microelectronics progress. Near-exponential growth will continue, increasing processing capability of microelectronics and, thus, making possible a variety of new telecommunications and information services.\textsuperscript{54}

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\textsuperscript{52} Op.cit., p.29.  
\textsuperscript{53} ibid., n.49, p.26.  
\textsuperscript{54} ibid., p.35.
Photonics or lightwave communications also underline future telecommunications. In this technology, photonics can be generated by lasers, routed by optical switches and transmitted in hair-thin optical fibres. Compared with other transmission media, light wave communication systems have the advantages of broad brand-width, which provides large information handling capacities, immunity to electrical and electromagnetic interference, low signal loss and small size and light weight.\(^5\)

One of the fastest areas in communications during recent years has been the local area network (LAN) to interconnect users (typically with computer terminals) over a common high speed medium. It seems possible to conceive new LAN architectures which trade the enormous fibre bandwidth in some way for ease and economy of access. These higher speeds should enable new forms of computer-to-computer load sharing and distributed processing.\(^6\)

The unexploited capacity of optical fibers is so great that this should become the medium of choice for all long-distance, point-to-point communication. International capacities should be greatly increased, with concomitant political, economic and sociological impacts.\(^7\) This, along with satellite systems, makes a greater part of a working telecommunications system.

No area of communications is harder to predict than computer communications. While computer hardware will continue to double in capability every two or three years, software will continue to be a bottleneck because it is innovative. Progress in the field may be more dictated by national

\(^5\) ibid., p.36.


\(^7\) ibid., p.601.
and international diplomacy, and through standard bodies, than through the traditional research methodologies.\textsuperscript{58}

Some of the important ever not recent years have been the evolution of LANs, the development of higher speed voice band modems using extraordinary sophisticated communications methodologies, the beginnings of ISDN (Integrated Services Digital Networks) with high speed modemless local connection.\textsuperscript{59}

In the future, the backbone long haul network will be directly assessable at high data rates through a number of metropolitan area network strategies including atmospherics and fibre optics, radio, dedicated cable and mobile radio approaches.

In sum, lightwave systems are becoming pervasive throughout telecommunications. They link up computer systems, bringing new capabilities right to the customers premises and spreading out between switching centres in the local and nationwide networks to allow greater and more varied services. Because of the rapid progress being made and the great potential remaining, lightwave technology is expected to dominate future transmission systems.\textsuperscript{60}

Another major telecommunications technology, software, refers to the sets of the instructions that tell the logic elements what action to take and when. Software determines what processors can and cannot do. The telecommunications network has come to depend increasingly on software e.g.,

\begin{enumerate}
\item \textsuperscript{58} ibid.
\item \textsuperscript{59} World Links, (Geneva,) 1989 no.8, p.66.
\item \textsuperscript{60} ibid., n.79.
\end{enumerate}
software used in the ESS switches in the bell and A&T networks handles more than 500 percent of telephone traffic.61

One factor arising out of this software support is reliability. Other factors relate to fault location, diagnostics, and maintenance. The benefits to be released from advances in microelectronics depend heavily on software. If additions continue to the telecommunications network, more complex system will be needed for reliability and cost effectiveness.62

It is to be noted that telecommunications has imparted change in business, trade and industry, education, health care. Banking and retail system have changed due to telecommunications; so has electronic mail changed the system.63

Similarly, national security in the international relations framework, has benefitted from emerging technologies mainly because new telecommunications technologies provide new capabilities and applications in microelectronics, photonics and military systems along with analog and digital computers, microwave and signal processing which had earlier applied themselves in military systems.64 Thus the important point is that in high-technology, military and civil applications become symbiotic.65

There is a common purpose pertinent to information technologies, to provide the users with the information are as numerous as the sources of

61 ibid.
63 ibid.
64 Times of India, (New Delhi), 5 April, 1991.
65 ibid.
information available in a society, which applications will emerge will depend on factors other than technology. It will depend on policy making of nations and nations and relations between nations.

THE INDIAN TELECOM INDUSTRY - AN OVERVIEW

Telecommunication has come out of the closet. For more than a century telecommunications was a government monopoly. The Department of Telecommunication (DOT) was responsible for not only providing the telecom services but also for manufacturing. The winds of change started blowing from the early 80's and a major breakthrough was catalysed by the 1991 U-turn in economic policy by the Government of India (Gol). From a dirigist economy government shifted to a market friendly economy. One consequence of this was the need for developing the telecommunication infrastructure as a part of the process of linking more closely the Indian economy with the global economy. This led to the enunciation of the National Telecom Policy on May 13, 1994.

At the level of global trade, the end of the cold war also gave an impetus to the GATT negotiations finally resulting in the setting up of the WTO. This has been quickly followed by two agreements which are critical to

References:
70 FICCI, n.6, p.15.
the development of the telecommunication and information sectors. The first is the Information Technology Agreement reached in December 1996. The second is the Global Telecom Pact which was signed in February 15, 1997.

**Telecom and Economic Development**

Telecom is a key infrastructure for economic development. There seems to be a direct link between the growth of the GDP and the telecom density. A one percent increase in telephone density, according to one estimate, can lead to a 3 percent growth in the GDP. The significance of telecommunication is being increasingly recognised especially after the policy U-turn made by the government in 1991 when for management of economy the shift took place from a dirigist approach to a market friendly paradigm.

**Impact of liberalisation and national telecom policy**

The basic impact of this change in policy is that there will be increasing competition even within the domestic market and the Indian industry will also have to compete globally. Telecommunication is necessary for keeping up the velocity of business and retaining the competitive edge especially in these days of time-based competition in the global market. The National Telecom Policy 1994 (NTP 94) which followed on May 13, 1994 was the direct result of the

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71 ibid.
72 ibid., n.6, p.23.
increasing realisation of the significance of telecommunication as the key infrastructure for economic development especially in a market friendly environment.  

Apart from this, the growth of telecommunication is also one method for giving a boost to the rural economy. For instance there may be 50-60 places in India where thanks to agricultural business there is greater need for telecom services. Focusing on these places and providing telecom services would give a push to the rural economy.  

India is divided into some developed regions and a lot of undeveloped regions. Providing telecom infrastructure in the backward regions can be one method of catalysing growth. Hence investment in telecom can also be seen as investment in balanced regional economic development. This is particularly true of North Eastern Region and the under developed parts of Eastern India.  

The Indian telecom scene

A look at the overall telecom scene in India at this stage will not be out of place. According to the India Infrastructure Report (Rakesh Mohan Committee Report)  

The telecom network in India today is not small in absolute terms. With more than 12 million lines, it is the 14th largest in the world. Yet it suffers from an abysmally low penetration of 1.3 percent per 100 population when the world average is over 10. More than 2.1 million

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76 Text, National Policy, 1994, Government of India.
77 ibid.
78 ibid.
consumers are in the queue waiting for a telephone line. Paradoxically, India may be fortunate to have such low tele density. Unlike many advanced countries, it does not suffer from large sunk investments in technologies which today are far becoming obsolete. It has the opportunity to leapfrog technologies and provide its people the benefits that are increasingly feasible from the incredible and continuing change that the telecommunications industry is going through worldwide. India’s vast size, the large number of spread out settlements and its large unserved population provide a huge potential for the expansion of telecommunication services. This opportunity must be seized. All this would need very rapid expansion and upgradation of the existing network. If the telecom network in India is able to grow at even the current annual growth of 20 percent for the next five years, then by the year 2001, it would rank among the sixth largest networks in the world. This in absolute terms would mean an addition of 30 million more basic telephone lines - a number expected to be second only to China.

Following the liberalisation policies adopted by the NTP 94, the Indian telecom sector becomes an exciting one. One objective of the NTP 94 was making India a base for manufacture of telecom equipment. The term “telecom industry” covers both manufacturing of the equipment and telecom services. From a global point of view, the total business in 1993 was of the

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80 ibid.
81 ibid.
82 ibid.
83 ibid.
order of $535 billions out of which $425 billion accounted for services and $110 billion for services. In the Indian telecom industry also we can expect the services to occupy a large share. At the same time the telecom equipment sector will also have a significant share though much less than that of services.

Historically telecom services as well as equipment manufacturing was the monopoly of the government. But in the 1980s equipment manufacturing was thrown open to the private sector and NTP 94 has carried the process to its logical conclusion by throwing the entire range of telecom services also to the private sector. In fact, compared to many other countries in the world, India is far more liberal in opening up the telecom sector for competition the entire range of services and equipment manufacturing.

**Current Status of the Indian Telecom Sector**

Growth of telecommunications in India over the years can at best be described as modest. India has a telephone density of less than 1 per 100 inhabitants as against the world average of 10 per 100 persons. This is lower than that of many developing countries of Asia.

<table>
<thead>
<tr>
<th>Country</th>
<th>Telephone Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1.7</td>
</tr>
<tr>
<td>Pakistan</td>
<td>2.0</td>
</tr>
<tr>
<td>Malaysia</td>
<td>13.0</td>
</tr>
</tbody>
</table>

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86 FICCI, n.7, p.12.


89 FICCI, working paper on Indo-U.S. commercial relation, 1996.
Of course, the above comparison is not meant for underplaying the development in the field of telecommunications in the country during the last 15 years or so. Selected data on telecom services in India are presented in Table 1.

### Table 1
**Key Data on Indian Telecom Service Sector**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1  Direct exchange Lines (DELS)</td>
<td>'000</td>
<td>5074.7</td>
<td>5809.9</td>
<td>6796.7</td>
<td>8025.6</td>
</tr>
<tr>
<td>1.2  Telephone waiting list</td>
<td>'000</td>
<td>1961.0</td>
<td>2287.0</td>
<td>2845.9</td>
<td>2496.8</td>
</tr>
<tr>
<td>1.3  Registered demand</td>
<td>'000</td>
<td>7035.7</td>
<td>8096.9</td>
<td>9642.6</td>
<td>10522.4</td>
</tr>
<tr>
<td>1.4  DELs added annually</td>
<td>'000</td>
<td>485.2</td>
<td>735.2</td>
<td>986.8</td>
<td>1228.9</td>
</tr>
<tr>
<td>2.1  Number of telex working lines</td>
<td>'000</td>
<td>46.7</td>
<td>48.6</td>
<td>49.1</td>
<td>47.2</td>
</tr>
<tr>
<td>2.2  Telex waiting</td>
<td>'000</td>
<td>2.8</td>
<td>3.3</td>
<td>2.4</td>
<td>1.6</td>
</tr>
<tr>
<td>2.3  Registered demand</td>
<td>'000</td>
<td>49.5</td>
<td>51.9</td>
<td>51.3</td>
<td>48.8</td>
</tr>
<tr>
<td>3.    Number of telephone metered call units</td>
<td>million</td>
<td>23897</td>
<td>30603</td>
<td>40130</td>
<td>46724</td>
</tr>
<tr>
<td>4.    Number of telex metered call units</td>
<td>million</td>
<td>470.5</td>
<td>451.2</td>
<td>388.6</td>
<td>337.4</td>
</tr>
<tr>
<td>5.    Number of effective trunk calls</td>
<td>million</td>
<td>224</td>
<td>206</td>
<td>206</td>
<td>162</td>
</tr>
<tr>
<td>6.    Number of inland telegrams booked</td>
<td>million</td>
<td>64.1</td>
<td>65.1</td>
<td>64.6</td>
<td>60.6</td>
</tr>
<tr>
<td>7.    Long distance circuits ends speech (equipped capacity)</td>
<td>'000</td>
<td>198.6</td>
<td>208.7</td>
<td>247.1</td>
<td>354.0</td>
</tr>
<tr>
<td>8.    Voice frequency telegraph (equipped capacity)</td>
<td>'000</td>
<td>47.6</td>
<td>48.5</td>
<td>48.5</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Source:** Annual Report, DoT, Government of India 1994.
Table 8
Plan Outlay for the Telecommunication and Physical achievement
during successive Plans

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan outlay</td>
<td>Rs. crores</td>
<td>47</td>
<td>66</td>
<td>164</td>
<td>159</td>
<td>415</td>
<td>781</td>
<td>567</td>
<td>2950</td>
<td>125</td>
</tr>
<tr>
<td>Local exchange</td>
<td>No.</td>
<td>291</td>
<td>543</td>
<td>1337</td>
<td>721</td>
<td>1272</td>
<td>1527</td>
<td>1192</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local exchange capacity</td>
<td>Lakh lines</td>
<td>1.16</td>
<td>1.74</td>
<td>3.59</td>
<td>2.61</td>
<td>4.44</td>
<td>5.40</td>
<td>3.19</td>
<td>15.60</td>
<td>54</td>
</tr>
<tr>
<td>Working connection (DELS)</td>
<td>Lakh lines</td>
<td>0.53</td>
<td>1.59</td>
<td>3.19</td>
<td>1.63</td>
<td>4.30</td>
<td>4.83</td>
<td>2.69</td>
<td>14.00</td>
<td>37</td>
</tr>
<tr>
<td>Telephone sets</td>
<td>Lakh lines</td>
<td>1.09</td>
<td>1.88</td>
<td>4.16</td>
<td>1.92</td>
<td>5.64</td>
<td>6.10</td>
<td>3.69</td>
<td>18.20</td>
<td>48</td>
</tr>
<tr>
<td>Long distance POC's</td>
<td>No.</td>
<td>918</td>
<td>651</td>
<td>430</td>
<td>674</td>
<td>1998</td>
<td>3721</td>
<td>5100</td>
<td>6170</td>
<td>2500</td>
</tr>
<tr>
<td>Manual trunk boards</td>
<td>No.</td>
<td>185</td>
<td>375</td>
<td>1098</td>
<td>1014</td>
<td>1811</td>
<td>1601</td>
<td>668</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td>Trunk automatic exchanges (TAX's)</td>
<td>No. of lines</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>13</td>
<td>1</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Tax capacity</td>
<td>No. of lines</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3500</td>
<td>3600</td>
<td>23350</td>
<td>9850</td>
<td>112040</td>
<td>298000</td>
</tr>
<tr>
<td>STD routes</td>
<td>No.</td>
<td>-</td>
<td>1</td>
<td>10</td>
<td>7</td>
<td>29</td>
<td>71</td>
<td>23</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Long distance speech channels</td>
<td>No.</td>
<td>353</td>
<td>823</td>
<td>3966</td>
<td>5604</td>
<td>13382</td>
<td>22375</td>
<td>11104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coaxial cable system &amp; other trunk cables</td>
<td>Route kms.</td>
<td>-</td>
<td>734</td>
<td>5190</td>
<td>2371</td>
<td>4538</td>
<td>4049</td>
<td>2996</td>
<td>13000</td>
<td>37125</td>
</tr>
<tr>
<td>Microwave systems</td>
<td>Route kms.</td>
<td>-</td>
<td>-</td>
<td>190</td>
<td>2080</td>
<td>2378</td>
<td>8627</td>
<td>3770</td>
<td>17000</td>
<td>3000</td>
</tr>
<tr>
<td>Public telegraph offices</td>
<td>No.</td>
<td>1550</td>
<td>1817</td>
<td>1803</td>
<td>1643</td>
<td>2062</td>
<td>5418</td>
<td>6552</td>
<td>20000</td>
<td>2500</td>
</tr>
<tr>
<td>Telex exchanges</td>
<td>No.</td>
<td>-</td>
<td>-</td>
<td>12</td>
<td>13</td>
<td>24</td>
<td>52</td>
<td>35</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
The principal physical targets of the telecommunications sector for the Eighth Five Year Plan (1992-1997) are presented in Table 2.

Table III

Physical Targets for Telecom Sector in the Eighth Plan

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>Status as on 31.3.92</th>
<th>Target during 1992-97</th>
<th>Likely status on 31.3.97</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local telephone system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching capacity</td>
<td>million</td>
<td>6.8</td>
<td>9.3</td>
<td>16.1</td>
</tr>
<tr>
<td>Direct exchange lines</td>
<td>million</td>
<td>5.8</td>
<td>7.5</td>
<td>13.3</td>
</tr>
<tr>
<td><strong>Long distance switching</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAX capacity</td>
<td>lines</td>
<td>196600</td>
<td>272000</td>
<td>468600</td>
</tr>
<tr>
<td><strong>Long distance transmission</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coaxial cable systems</td>
<td>R km</td>
<td>27420</td>
<td>3000</td>
<td>30420</td>
</tr>
<tr>
<td>Microwave systems</td>
<td>R km</td>
<td>36786</td>
<td>20000</td>
<td>57786</td>
</tr>
<tr>
<td>UHF systems</td>
<td>R km</td>
<td>21157</td>
<td>150000</td>
<td>171157</td>
</tr>
<tr>
<td>Optical fibre systems</td>
<td>R km</td>
<td>8810</td>
<td>20000</td>
<td>28810</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDPTs</td>
<td>Nos.</td>
<td>38952</td>
<td>338000</td>
<td>377000</td>
</tr>
<tr>
<td>Telex capacity</td>
<td>Nos.</td>
<td>54660</td>
<td>31200</td>
<td>85860</td>
</tr>
</tbody>
</table>

Source: FICCI - Sectoral Background Notes 1997.
PROBLEMS OF THE INDIAN TELECOM INDUSTRY

Double limitation of telecom equipment manufacturing

The Indian telecom industry however faces a number of problems in this context. Firstly, as the liberalisation of equipment manufacturing took place in 1980 when the overall policy was still a dirigist one, the capacities which created have been of a very small size so far as the equipment manufacturing sector is concerned. This was further complicated by the fact that the services were still the monopoly of the Department of Telecommunication (DOT) and hence, the DOT was the monopoly. So the equipment manufacturing sector today faces a double limitation created by the licensing raj on one side and market being totally controlled by DOT on the other.

Negative impact of DOT's tender policy:

The monopoly of the DOT has also led to another vicious development. "AS DOT was the single buyer and being a government department it wanted to be fair to all the manufacturers, having approved seven technologies for manufacture, every time the DOT opened its tenders, it goes by the lowest tender. But the entire tender is not given to the lowest bidder. It is given to all the competitors in a rationed manner with some incentive for the lowest bidder. However in the process of trying to be fair the system of the DOT has

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90 Electronics Information, n.85, p.223
91 R&D Indicators, AIST. (Tokyo 1988). Also, R&D Industry, Department of Science and Technology (New Delhi, 1988).
94 FICCI, n.7, p.13.
only ended up by making beggars of everybody. No company gets an order which will encourage manufacturing in depth. As a result, we see today the Indian telecom industry being dominated by a number of joint venture companies and their capacity utilisation is well below the break even point. No wonder the entire telecom equipment manufacturing is still in the screwdriver age. 95

Delay in TEC approval

Another factor inhibiting growth is the prolonged TEC type approval procedure leading to an unhealthy impact on the growth of the component industry. 96 The following telecom equipments are manufactured in India.

Switching Equipment

For small Exchanges (2000 lines)/For Large/ For Trunk Automatic Exchanges

Transmission equipment 97

6GHz/140 Mbps Microwave (TX/RX)

7 GHz Mbps Microwave (TX/RX)

11 Gz/140 Mbps Microwave (TX/RX)

13 GHz/34 Mbps Microwave

2 GHz/8 Mbps Microwave (TX/RX)

13/15/16/18/23/28 GHz Microwave

95 ibid., p. 14.
96 ibid.
97 Hindustan Times, (New Delhi), 10 April, 1992.
4/36 Analogue MARR in UHF Band

565/140/34/8 Mbps Optical

Optical Line Terminating

Digital Cable Pair Gain System

**Terminal equipment**

a. External Plant Equipment

- Telecom Power Plant
- PIJF Cable
- Optic Fibre Cable
- Drop Wires
- PVC Pipes (7X12)
- Telephone Poles
- Antenna for M/W Equipment
- Telephones
- Fax Machines

b. Data Communication Equipment

- Modems-Leased/Dial Ups

c. Equipment for Value Added Services

- Pagers (Numeric & Alphanumeric)
- PCs & Modems for E-Mail Service

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98 ibid.
According to the Telecom Equipment Manufacturers Association, the following are manufactured in India:

**Switching equipments**

All types of telephone exchanges. Small/medium/large/trunk/EPABX etc.

**Transmission equipments**

Microwave radio relay equipment (all bands)

Analyser MARR (UHF/VHF)

OLTE/Repeaters/Optical Multiplex (PDH/SDH)

Digital Pair Gain System

Satellite Earth Stations.

**External Plant Equipment**

Telecom Power Plant (SMPS/Conventional)

PIJF Cable

Optical Fibre Cable

Drop Wires

PVC Pipes

Telephone Poles and accessories

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99 ibid

100 ibid

101 ibid.
Antenna for M/W Equipment

PLCC equipment

Terminal equipments already being manufactured

Line Telephone Instruments (Push Button/Rotary)
Key Telephone
Features Phones
Cellular Phones
Modems
Pagers
Fax
PABX/PBX
Wireless Phones
Trunking handsets

Difference in Approach of Equipment Manufacturers and Service Providers

Another interesting aspect of the equipment is that there seems to be a total difference of interests between them and the telecom service providers, the private sector who will now be coming up and also the DOT as service provider. In 1993 the DOT was not in favour of levying a countervailing duty on imported components even though as the Department of Electron
(DOE) pointed out that this would help save the investments that have already come into the sector for equipment manufacturing\textsuperscript{103}. The DOT took the very limited view that it would save Rs. 200 crores by way of countervailing duty\textsuperscript{104}. However subsequently in 1994-95, this defect was corrected. Especially after the 1997-98 budget where the duty rates have been brought down, the telecom service providers are likely to go in for imported components as the indigenous components are likely to be costly\textsuperscript{105}. At the same time, the indigenous industry cannot grow unless there is some differential between the raw material, the intermediates and the finished products.\textsuperscript{106} The development of the indigenous telecom industry therefore is an issue that requires serious consideration.

The strategy should be clear if we want the telecom industry covering both equipment manufacture and services to grow in the country. Services constitute 80\% of the global telecom business and equipment the remaining 20\%. In terms of fulfilling the needs of the public, services come first.\textsuperscript{107} Once the services grow the market for equipment manufacture comes into being. In a way the trend can be compared to the dynamics of the growth of the world trade.\textsuperscript{108} First comes the trade, a market is established and then manufacturing becomes economically viable.\textsuperscript{109} "We would therefore recommend a strategy taking this basic sequence in the dynamics of the growth..."
into account. We have therefore framed our strategy and recommendations to achieve a healthy growth of the Indian telecom industry.\textsuperscript{110}

Further, on June 2, 1997 the Ministry of Finance has further reduced the duty to 20% on selected items needed for basic telecom service, cellular mobile telephone service, radio paging service and for VSAT data networks.\textsuperscript{111}

In this context, we must begin with the basic question whether India should focus on manufacturing of telecom equipment at all. The experience of the service providers in the cellular services brings out a glaring fact. Though orders worth Rs. 4000 crores have been given for equipments by the service providers, there has been hardly any significant order given to any Indian equipment supplier\textsuperscript{112}. Import seems to be the dominant system.\textsuperscript{113} A number of reasons are being attributed to this development. Firstly there is a perception that even when Indian equipments are available, the buyers ask for a 15% discount because it is a local product.\textsuperscript{114} Secondly, because many of the items in telecommunication especially at the consumer end like handsets have a consumer angle, brand equity seems to play a significant role.\textsuperscript{115} Thirdly the MNCs also give the argument that they have with their OEM suppliers arrangements globally and they cannot source from India.\textsuperscript{116} Nevertheless, in a

\textsuperscript{110} Suggestion by the Telecom Equipment Manufactures with regard to the WTO-FICCI- Task Force Report on Telecom. 1997

\textsuperscript{111} Economic Times, (New Delhi), 6 June 1997.

\textsuperscript{112} Hindustan Times, (New Delhi), 29 April, 1997.

\textsuperscript{113} (The issue of imports and Switching equipment has been discussed by T. Sarkar). T. Sarkar, "Switching, vol.3, no.7, 1990, pp.63-68.

\textsuperscript{114} ibid, n.7, p.18.

\textsuperscript{115} ibid.

\textsuperscript{116} ibid.
competitive environment, in the ultimate analysis, bottomline is going to prevail. Unless the Indian equipment manufacturer is able to bring down his cost and provide the type of services expected out of the current OEM suppliers of the MNCs, he will not be able to breakthrough.\textsuperscript{117} But here the Indian companies face a catch-22 situation. Unless they are given orders, they can never grow.\textsuperscript{118} The DOT has been playing a nurturing role and perhaps it may still continue\textsuperscript{119} in future because of the fact that like British Telecom,\textsuperscript{120} atleast in the next five years if not more, a significant part of the market is going to be of DOT. It is interesting that DOT estimates that by the year 2007, 33% will be from the private sector and 67% will be from DOT.\textsuperscript{121}

"The Department of Telecommunication (DOT) expects the private basic service operators to provide atleast 200 lakh direct exchange lines (DELs) in the country in the next 10 years. According to the report on perspective plan for telecommunication services for 1997-2007 prepared by DOT,\textsuperscript{122} there will be an additional demand of 674 lakh phones over the period of next ten years out of which DOT will have to provide 470 lakh phones over the period of next ten years out of which DOT will have to provide 470 lakh lines to offer telephoe on demand.\textsuperscript{123} "As the basic services are being opened to private

\textsuperscript{117} ibid., n.7, p.18.
\textsuperscript{118} Economic Times, (New Delhi), 29 May, 1997.
\textsuperscript{119} Telecom a need to Review: B.K. Modi, Chairman Expert Committee on Elect. & Telecom Manufacturing Association of Information Technology (MAIT), New Delhi, January 8, 1991.
\textsuperscript{120} "Telecom: Keeping the Customer Satisfied", World Look, p.64.
\textsuperscript{121} Annual Report, Department of Telecommunications, Government of India, 1995-96.
\textsuperscript{122} Department of Telecommunications, Government of India, 1997.
\textsuperscript{123} ibid.
sector, it is assumed that about 204 lakh of this additional demand will be met by the private sector". As per DOT estimates, the telephone density in the country which is presently at about 1.5 telephone per hundred, will reach around 3 per hundred in 2000 and 9 per hundred by 2007. The total requirement of funds for the perspective plan of 10 years for DOT to provide 407 lakh lines has been estimated at Rs. 2,32890 crores which include Rs. 30,017 crores enmarked for MTNL for providing 63 lakh lines. Out of this, Rs. 73,229 crores has been provided for the requirement of DOT in the first five years (9th Plan) and Rs. 1,29654 crores for the 10th Plan. In addition, DOT will have to shell out Rs. 4,627 crores as liability due to alternate financing like deferred payment".

FICCI Report -1997 states "Hence the total requirement of funds for the 9th Plan will be at Rs. 77,856 crores which is proposed to be financed through withdrawal from reserve funds to the tune of Rs. 41,336 crores, other internal resources amounting to Rs. 12,597 crore, extra budgetary support of Rs. 12,923 crore and alternate financing for remaining Rs. 8000 crore. However, for the 10th Plan, the department has not proposed to take any funds from the extra budgetary support and alternate financing and plans to

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124 ibid.
125 ibid.
126 ibid.
127 ibid.
129 ibid.
130 ibid.
finance entire fund requirement of Rs. 1,32,420 crore through reserve funds and interna resources. During these ten years, DOT plans to introduce several intelligent network (IN) services in phased manner.\textsuperscript{131} The services include free phone service in which a subscriber can make a free call to a company and the payment for these calls will be made by the company as it will help them to advertise and sell their products.\textsuperscript{132} In services will also include the facilities of account card calling in which a subscriber can call using the personal account number and the payment will not be charged to the telephone from which the call is made. Universal access number facility will also be provided.\textsuperscript{133}

Yet another aspect of marketing by the telecom equipment manufactures is that many service providers are looking for one stop shopping.\textsuperscript{134} In the various elements involved in settin up a telecom networking service, they are looking to such turnkey contract capability.\textsuperscript{135} Indian telecom equipment manufactureres will perhaps have to develop this capability or a consortium approach if they want to make a break through.\textsuperscript{136}

Another important factor that has been coming in the way of the manufacturing industry are the tariff policies which seem to discourage local manufacture. Government have adopted the policy of continuously decreasing the tariff levels which may come to around 30%, the level in other south east

\textsuperscript{132} ibid.
\textsuperscript{134} TEMAS, Suggestions, with regard to WTO Agreements, refer Annexure II.
\textsuperscript{135} ibid., n.133.
\textsuperscript{136} ibid., (CII, Seminar, 1997).
Asian countries.\textsuperscript{137} Because of the information technology agreement and the global telecom agreement under the whole system more transparent. Quantitative restrictions may not be possible.\textsuperscript{138} This raises the issue that there should be a differential between raw material, intermediaries and finished goods so far as the telecom equipment are concerned. We should be able to adopt an intelligent strategy for this purpose.\textsuperscript{139}

In this context, the approach suggested by TEMA in a representation to the government needs to be considered seriously by the government and adopted. In the liberalised context, asking for a quota system as in the case of garment/textiles may not be possible. The strategy of gradual reduction of duties may be desirable.\textsuperscript{140} The basic principle of reducing duties on components and capital goods to zero needs to be considered immediately.\textsuperscript{141}

Role of Telecom Regulatory Authority of India (TRAI): in the Growth of the Telecom Industry and Related Technology Transfer.

The Telecom Regulatory Authority of India has been recently established yet it has a responsible task ahead towards contributing a healthy growth of the Indian Telecom Industry and its related technology transfer.

\begin{flushleft}
\textsuperscript{137} \textit{ibid.}, n.6, p.12. \\
\textsuperscript{138} ibid. \\
\textsuperscript{139} \textit{Economic Times}, (New Delhi), 3 May, 1997. As well as \textit{FICCI Reports}, n.7, p.17. \\
\textsuperscript{140} ibid. \\
\end{flushleft}
The powers of the TRAI have been spelt down below. The important powers are: (a) ensure technical compatibility and effective inter relationship between different service providers; (b) regulate arrangements among service providers of sharing their revenue derived from providing telecommunication services; (c) facilitate competition and promote efficiency in the operation of telecom services to facilitate growth in such services; and (d) settle disputes between service providers. The private sector can use these powers of the TRAI for removing all the difficulties they face in their one-sided contracts with DOT. For example, the following decisions have rendered the telecom business unprofitable in India: (I) restrictions regarding the number of circles in which a private service provider can operate; (II) restriction regarding the tariff; and (III) denial of right for providing nationwide STD and ISD calls.

The private sector must raise all the issues in the contract they have signed with DOT with which they do not agree as a one function of the TRAI is to facilitate competition and promote efficiency in the operation of the telecom services to facilitate growth in such services. How can one player, DOT, have the power for nationwide STD and international calls and the private sector prohibited from providing these services? This is an issue that could be challenged before the TRAI.

Of course there is a catch. The TRAI may have powers under section 11, but the government can always resort to the tremendous powers it has.

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142 FICCI, n.7, p.25.
143 Ibid.
144 FICCI, n.7, p.25.
under Section 25. Under this, the central government may from time to time, issue such directions to the TRAI as it may think necessary in the interests of sovereignty and integrity of India, security of the state, friendly relation with the foreign states, public order, decency and morality. The TRAI shall be hounded by such directions and questions of policy as the central government may give in writing to it from time to time, provided that the authority shall, as far as practicable, be given an opportunity to express its views before whether it is a question of policy or not, shall be final.146

Whenever an inconvenient issue is raised before the TRAI, government can resort to use Cause 25. If the TRAI is to function effectively, especially in matters relating to competition, its views should prevail. The TRAI provides an excellent opportunity for the private sector to virtually redraft the contracts for their operation so that they can start their projects on a viable footing. Incidentally, the financial institutions which are finding the telecom projects not viable for funding today, will also find that once these correctives are initiated by the TRAI, telecom becomes a very healthy sector to finance. The NTP 94 gave us a vision of a telecom revolution in the country. Will TRAI be the catalyst to make that revolution a reality? Only the future will tell.

Telecommunication Equipment Scenerio : Problems Prospects of Technology Transfer

The telecom industry consists of two mutually exclusive, yet highly dependent parts—vis-(a) Telecom equipment industry (b) Telecom Services.
In 1993, the global telecommunication business was about $535 billion, out of which $425 billion was in the services and $110 in equipment manufacture. Therefore, one can take a broad view that 80% of the telecom business is in the services and 20% is equipment manufacture.\textsuperscript{148}

Though, the levels of technology transfers effects both the sectors i.e Services & Equipment yet, the equipment sector drives most of the attention and also puts lots of ticklish question towards it transfers. The technology transfers is determined by the developments that are taking place in the telecom industry around the world. The industry is digopolistic, but has a highly concentrated national structure. Because of the intense competition existing in the world, the only big players today existing on the international arena are a handful of countries led by U.S.\textsuperscript{149}

Because of these monopolistic tendencies, the technology transfer to developing countries in the telecom as well as the entire information technology sector has become very difficult. The reason being circumstances in which a country concedes to the demands of these technology giants smooth flow becomes a problem. Either the restrictions come in the form of patents violation or strategic defence technology proliferation etc. Towards these issue U.S. tops the lists.\textsuperscript{150}

Also even if a country provides the necessary condition for the flow of technology with either in the form of FDI (Foreign Direct Investment) or directly, the flow of state of the art technology remains a distant dream towards

\textsuperscript{148} Ibid.

\textsuperscript{149} Economic Times, (New Delhi), 22 May, 1993.

\textsuperscript{150} Ibid.
this effect of course, the recipient countries adaptive and acquisitive capacity also pose as a determining factor yet lots depend upon the willingness of the donor country towards this effect. Also, the recipient countries internal regulatory laws and regulations as well as the import duties etc does play a role in the technology transfer.\textsuperscript{151} However, it should be noted here that despite the laws and regulation of the recipient countrie the flow of the latest state of the art technology depends upon the factors which determines the conditions of favouring the technology transfer of the countries like U.S. and ohters.\textsuperscript{152}

Some of the major firms manufacturing equipment for both defence and civilian use are \_ATT, IBM, GTE, lateral, Northern Telecom Ericsson, NEC, Fujitsu, GEC, Philips, Piassy, Siemens and Alcated.\textsuperscript{153}

The Indian context

The 1994 National Telecom Policy has spelt out the priorities for the development of the Indian Telecom Industry. The policy brings out the concepts of universal service and world standard quality of service. In equipment manufacture, the policy visualises India to become a manufacturing base for telecom equipments.\textsuperscript{154}

Towards this efect, owing to their respective importance in the telecom Industry two components needs indepth analysis viz

(a) Switching Technology

\hspace{1cm} \textsuperscript{151} Times of India, (New Delhi), 27 June, 1997.
\hspace{1cm} \textsuperscript{152} P-Purkaystha, "Infrastructure Sector and Withdrawal of the State". \textit{EPW}, 26 August, 1995, p.419.
\hspace{1cm} \textsuperscript{153} T. Sarkar, "Global Changes and Local Adjustment", \textit{Telematics}, vol.3, no.6, pp.68-73, 1990.
\hspace{1cm} \textsuperscript{154} T- Sarkar- Switching, \textit{Telematics- Vol.3, No.7 1990}. 227
(a) Switching Technology is one of the major technological sector of the Telecommunication component Industry. The Switching market is highly concentrated. Also there is a tendency towards market saturation in the developing country market especially electronic switching system (ESS) and EPABX.155

Switching technology is going more and more digital for reasons of speed and efficient call handling adaptiveness and added on services easily facilitated. This uses high band with using optical fibre, which is replacing old electromechanical types. Infact, switching market is highly oligopolistic and technology is closely held by large multinationals.156 Therefore it is difficult for

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156 Telematics India, April, 1990, p.25.
DOT LIST OF TELECOM EQUIPMENTS PRESENTLY MANUFACTURED & NOT MANUFACTURED IN INDIAN TELECOM EQUIPMENT CURRENTLY MANUFACTURED IN INDIA

**SWITCHING EQUIPMENT**

1. For small Exchange (2000 lines)
2. For Large Exchanges
3. For Trunk Automatic Exchange

**TRANSMISSION EQUIPMENT**

1. 6 GHz/140 Mbps Microwave (TX/RX)
2. 7 GHz Mbps Microwave (TX/RX)
3. 11 GHz/140 Mbps Microwave TX/RX
4. 13 GHz/34 Mbps Microwave
5. 2 GHz/8 Mbps Microwave (TX/RX)
6. 13/15/16/18/23/38 GHz Microwave
7. 765/140/34/8 Mbps Optical
8. 6 GHz/4 GHz Microwave
9. Optical Line Terminating
10. Digital Cable Pair Gain System

**TERMINAL EQUIPMENT**

_A. External Plant Equipment_
1. Telecom Power Plant
2. PIJE cable
3. Optical Fibre Cable
4. Drop Wires
5. PVC Pipers (7X12)
6. Telephone Poles
7. Antenna for MW Equipment
8. Telephones
9. Fax Machines

_B. Data Communication Equipment_
1. Modems-Leased/Dial Ups
2. Pagers (Numeric & Alphanumeric)
3. PCs & Modems for E-Mail Service

**A. BASIC TELEPHONE SERVICE**

1. Wireless in Local Loop System excluding Terminal Equipment
2. HDSL Systems
3. DLS System
4. SDHEquipments

**B. CELLULAR MOBILE TELEPHONE SERVICES**

Infrastructural Equipment for Cellular Mobile Telephone Service Excluding backbone network viz.

1. Mobile Switching
2. Base Transceiver Stations (BTS)
3. Base Station Controllers (BSC)
4. Cellular Repeaters
5. Network Management Stations
7. BTS Ancillary Equipment
8. BSS Test Equipment
9. Transcoders
10. Short Message Service Hardware
11. Voice Mail Service Hardware
12. Automatic Call Distribution Equipment

**C. RADIO PAGING SERVICE**

Infrastructure Equipment for Radio Paging Service Viz:

1. Paging Control Terminal
2. Transmitter Controller
3. Paging Transmitter
4. Link Transmitter
5. Link Repeater
6. Monitor Receiver
7. Link Receiver
8. N+1 Arbitrators for above
9. Combiners
10. Automatic Monitoring System
11. Network Management & Control System
12. Integrated ACD/OAP System
13. Isolators
14. Cavity Folders
15. Multi Couplers
16. Directional Power Sensors
17. Communication Analysers
18. Radio Communications test set up
19. POCAG or FLEX encoders
20. Global Positioning Systems
21. Simul Cast Controller
22. Modems

**D. CLOSED USERS GROUP 64 KBPS DOMESTIC DATA NETWORK VIA INSAT SATELLITE SYSTEM IN EXTENDED C-BAND**

1. SCPC-DAMA Satellite based System Equipment
2. TDM-TDMA Satellite based System Equipment
3. Network Management System

Source: DOT Publication, 1997
developing countries to acquire the digital switching technology, without paying a part of the development cost.

Table IV

R&D Expenditure of Selected Firms Working on Telecom Technology

<table>
<thead>
<tr>
<th>Firm</th>
<th>Country</th>
<th>R&amp;D Expenditure 1988 (Million US$)</th>
<th>R&amp;D Expenditure as % of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATT</td>
<td>USA</td>
<td>2572</td>
<td>7.3</td>
</tr>
<tr>
<td>Siemens</td>
<td>W.Germany</td>
<td>3690</td>
<td>10.9</td>
</tr>
<tr>
<td>ITT</td>
<td>USA</td>
<td>525</td>
<td>6.1</td>
</tr>
<tr>
<td>Northern Telecom</td>
<td>Canada</td>
<td>710</td>
<td>13.1</td>
</tr>
<tr>
<td>Eriesson</td>
<td>Sweden</td>
<td>550</td>
<td>11.2</td>
</tr>
<tr>
<td>NEC</td>
<td>Japan</td>
<td>2008</td>
<td>8.8</td>
</tr>
<tr>
<td>GTE</td>
<td>USA</td>
<td>251</td>
<td>1.6</td>
</tr>
<tr>
<td>IBM</td>
<td>USA</td>
<td>5900</td>
<td>14.7</td>
</tr>
<tr>
<td>CIT/Alcatel</td>
<td>France</td>
<td>1005</td>
<td>7.7</td>
</tr>
<tr>
<td>Fujitsu</td>
<td>Japan</td>
<td>1498</td>
<td>8.9</td>
</tr>
<tr>
<td>Plessey</td>
<td>UK</td>
<td>196</td>
<td>6.6</td>
</tr>
<tr>
<td>GEC</td>
<td>UK</td>
<td>1196</td>
<td>10.3</td>
</tr>
<tr>
<td>MITEL</td>
<td>Canada</td>
<td>55</td>
<td>12.7</td>
</tr>
<tr>
<td>HITACHI</td>
<td>Japan</td>
<td>2204</td>
<td>4.7</td>
</tr>
<tr>
<td>PHILIPS</td>
<td>Netherlands</td>
<td>2338</td>
<td>8.2</td>
</tr>
<tr>
<td>ITI</td>
<td>India</td>
<td>22</td>
<td>5.7</td>
</tr>
<tr>
<td>BEL</td>
<td>India</td>
<td>17</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Source: R&D Score Board, Business Week, (Bombay), 14 August, 1989.
In terms of current aggregate indicators the telecom sector in India presents the following scenario with significant potential for growth and investment:

**Capacity Switching**

<table>
<thead>
<tr>
<th>Lines</th>
<th>Requirement (1992-97)</th>
<th>7.5 million additional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funds Needed</td>
<td>$10 to 12 billion</td>
<td>$ 3 to 5 billion</td>
</tr>
<tr>
<td>8th Plan Outlay (1992-97)</td>
<td>$7 to 8 billion</td>
<td>$7 to 8 billion</td>
</tr>
</tbody>
</table>

Table 4 gives the R&D expenditure of major firms operating in the area of telecom technology.

### Table V

**R&D Expenditure by Telcom Industry**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>India (Public Sector Firms)</td>
<td>1090 (0.2)</td>
<td>12.06 (0.20)</td>
<td>14.86 (0.20)</td>
<td>NA</td>
</tr>
<tr>
<td>India (Private Firms)</td>
<td>0.8 (1.3)</td>
<td>1.1 (1.27)</td>
<td>1.29 (1.42)</td>
<td>NA</td>
</tr>
<tr>
<td>USA</td>
<td>2925 (4.3)</td>
<td>NA</td>
<td>2909 (5.5)</td>
<td>3127 (5.7)</td>
</tr>
<tr>
<td>Japan</td>
<td>8813 (4.6)</td>
<td>8502 (5.3)</td>
<td>9361 (5.6)</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Source:** R&D Score Board, *Business Week*, (Bombay), 14 August, 1989.

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Note: Figure in brackets are R&D expenditure as a per cent of sales.

The Department to Telecom purchase budget telecom equipment according to the 8th Plan 1990-95\textsuperscript{158}

Table V

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><strong>Switching</strong></td>
<td><strong>Rs. 6,996</strong></td>
</tr>
<tr>
<td>B</td>
<td><strong>Transmission</strong></td>
<td><strong>Rs. 3,650</strong></td>
</tr>
<tr>
<td>C</td>
<td><strong>Cables</strong></td>
<td><strong>Rs. 4,740</strong></td>
</tr>
<tr>
<td>D</td>
<td><strong>Terminal Equipment</strong></td>
<td><strong>Rs. 2,194</strong></td>
</tr>
<tr>
<td>E</td>
<td><strong>Ancillary Products</strong></td>
<td><strong>Rs. 690</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total Rs.</strong></td>
<td><strong>18,270</strong></td>
</tr>
</tbody>
</table>

Source: Department of Telecom, (Ministry of Communications, New Delhi 1990-95).

The capital investment for the manufacture of Telecom Equipment for the Eighth Plan being a total of Rs. 2,200 crores with the foreign exchange component of Rs. 788 crores, it is a large investment and may change the entire telecom sector.

The likely imbalance in the production capacity has to be surveyed and rectified (for the period of 8th Plan, 1990-95).\textsuperscript{159}

\textsuperscript{158} Department of Telecom, (Ministry of Communications, New Delhi 1990).

231
Table VI

<table>
<thead>
<tr>
<th>Item</th>
<th>Required</th>
<th>Production Capacity</th>
<th>Imbalance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cables</td>
<td>750 lacs km</td>
<td>1100.0 lacs km</td>
<td>350.00 lacs km</td>
</tr>
<tr>
<td>- Co-anials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Jelly filled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibre Optic</td>
<td>2.5 lacs km</td>
<td>6.0 lacs km</td>
<td>3.5 lacs km</td>
</tr>
<tr>
<td>Electronic Switch</td>
<td>75.0 lacs lines</td>
<td>25.0 lacs lines</td>
<td>50.0 lacs lines</td>
</tr>
</tbody>
</table>

Source: Department of Telecom, (Ministry of Communications), New Delhi, 1990.

The expenditure budget of telecom equipment worth 18,000 crores need not come from the exchequer's money. The total requirement can be funded as follows. 160

- Deposits from subscribers;
- Internal accruals of DOT and MTNL;
- Deposits through Public Bonds;
- Direct Purchase by subscribers; and
- Leasing of Equipment by subscribers.

Again, capital investment can be rationalised by augmenting the electronic switching capacity in the private sector. 161 (which has now been mooted) 162 and

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159 ibid.


by permitting foreign technology and investment so as to avoid a burden on the government for foreign exchange as well as for capital investment.

Yet there is a major argument against imports, especially switching technology. The issue here seems to be that imports would lessen self-reliance.

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Another alternative would be to keep this on a two-track level i.e. import only the essential and the needed and indigenise all that can be.

All this was in consonance with the strategy proposed in the Seventh Five Year Plan of Government of India. The strategy proposed for the Telcom for 1985-90 by the Planning Commission was:

1. Balanced growth in network;
2. Rapid modernization;
3. Quantum jump in technology;
4. Increased productivity; and
5. Innovations in organizations and management

Keeping these objectives in view, digital switching technology was identified as the thrust area by the Telcom Commission.

(a) Improve quality of service;
(b) Increase urban PCOs;
(c) Improve delivery of telegrams;
(d) Provide telex on demand;
(e) Improve rural communications; and
(f) Build up a national digital network.

Due to pregnant changes in the government in the past few years, these programmes were not followed carefully. Nevertheless, there has been a change insofar as motivating the telcom sector towards greater efficiency.

165 Department of Telecom, *(Ministry of Communications, New Delhi)*, 1992.
Table VI

Growth in Telecom Equipment and services exports is as follows

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Services</td>
<td>175</td>
<td>282</td>
<td>456</td>
<td>598</td>
<td>902</td>
</tr>
<tr>
<td>Consultancy</td>
<td>83</td>
<td>119</td>
<td>118</td>
<td>207</td>
<td>235</td>
</tr>
<tr>
<td>Hardware</td>
<td>20</td>
<td>24</td>
<td>58</td>
<td>131</td>
<td>310</td>
</tr>
<tr>
<td>Total</td>
<td>278</td>
<td>425</td>
<td>632</td>
<td>936</td>
<td>1447</td>
</tr>
</tbody>
</table>


Table VII

Growth in Telecom Equipment and services exports

<table>
<thead>
<tr>
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<td>632</td>
<td>936</td>
<td>1447</td>
</tr>
</tbody>
</table>


It is, again, a fact that during the Seventh Five Year Plan (1985-90), the annual growth in this sector has been averaging 28 percent.\(^{166}\) In 1985, the total telecommunications equipment and service market was $950 million, $400 million of which consisted of imports. By 1987, the market had grown to $400 million of which consisted of imports. By 1987, the market had grown to

$1275 million, with imports at $52.5 million. Total imports are projected at $2 billion during 1988-1990.\(^{167}\)

The U.S. accounts for approximately 15 percent of India's telecom imports behind Japan and France with 36 percent and 17 percent respectively.\(^{168}\) There is a large indigenous telecom industry that wants to maintain its share of the market. The public sector is expected to $12 billion in the Eighth Five Year Plan (1990-1995) while the private sector may grow to as large as a $6 billion market.\(^{169}\)

Collaborations such as joint ventures, licensing agreements and technology transfers are preferred. Much of the transfer of technology takes place through firms, joint ventures, collaborations, licensing and training the educators and at the educational institutions.

Imports are not permitted to be held in inventory, so foreign firms must have contracts with end users. With the (1994) policy changes, this will be somewhat different.

The best sales prospects for U.S. business include customs maintenance systems, satellite systems, digital microwave transmission equipment, data communications, PBXs and components technologies.\(^{170}\)

It is evident that India's imports in the telecom sector have been increasing and, definitely, the U.S. is one of the foremost nations India is importing from.

\(^{167}\) ibid.  
\(^{168}\) ibid.  
\(^{169}\) ibid.  
\(^{170}\) ibid.
There have been detailed discussions and tabled information in the Indian Parliament on telecom imports, manufactures including in public sector units and collaborations.\textsuperscript{171}

With so many elaborate procedures of transferring of technology, it is not possible to gauge exact cost nor project the exact volumes.

While indigenous technology is developing slowly, the greatest demand in collaboration has been in switching, transmission, user terminals and modems.

**Options before India:** The former Prime Minister Rajiv Gandhi gave a major thrust to telecommunications development in India through his controversial friend Satyen G. (Sam) Pitroda, instrumental in establishing the Centre for Development of Telematics (C-DOT), perhaps the second milestone after ITI.\textsuperscript{172}

The controversy switching C-Dot, whether it delivered its products according to schedule or not is not the issue here nor is it required to be gone into for the purpose of this argument. neither is the criticism of ITI valid. The issue today is whether India should wait till these organisations come of age and start delivering, or go ahead and sign collaboration agreements with major foreign providers, develop telecommunications services in the country, and provide enough lead time to ITI and C-DOT to develop.\textsuperscript{173}


\textsuperscript{172} Arun Bhattacharjee, "Telecom Forge Alliances of Bust", *Telematics India*, vol.3, no.20, July 1990, p.45.

\textsuperscript{173} ibid.
In this regard, the former Chairman and Managing Director of Videsh Sanchar Nigam Limited (VSNL), T.H. Chowdary, observes: "there is no sense postponing improvement, new facilities and new services until we invent new technologies, that way the gap between us and the developed countries would increase. We should forge strategic alliances with willing leading companies of the world... We must have the latest technology collaborations and try to have strength in a variety of transmission equipment, in cellular radio, in optical fiber equipment and terminal devices. Our country is big enough, our needs are huge and we can sustain more than one technology".174

The international telecom companies think alike. Most of them believe that India has the capacity to sustain parallel services. Their perception is that the value of telecom growth is poor in India, divided between the technocrats and bureaucrats.

Self reliance in telecom is a myth right now. Telecom development will have to be at parallel levels, import only as necessary and indigenise alongside.

Thailand and South Korea protect their component industry as a rationale for import substitution strategy. This makes sense to them only if done in a selective and time-bound manner, not across the board and not indefinitely.175

Enquiries reveal that option for new value added services in communication does not necessarily mean outflow of foreign exchange, nor is it a drain on the economy of the country e.g., Thailand is getting new services from a major international provider without spending a penny. The agreement

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174 ibid.

175 Times of India, (New Delhi), 13 August 1991.
is to reimburse 5 per cent as royalty and operating charges, normal in international trade practice.\textsuperscript{176}

A recent study by the FICCI states that large MNCs are unwilling to invest in India because the conditions for technology transfer, including indigenisation stipulation, buy back or export obligation, royalty terms and lack of intellectual property protection are constraints to investment in India.\textsuperscript{177}

Another major problem of Indian telecom sector is the underutilization of capacity. Indian Telephone Industries have a production capacity of 1.05 million but the Department of Telecommunications can hardly place orders for 1 million annually.\textsuperscript{178} Policy makers really ought to have thought before creating 5 times more capacity in the country. The low demand is not because of any lack of demand from the people but the inability of network managers to provide the system.\textsuperscript{179}

Most of the telecom equipment is imported or got through technological transfer. Even so, ITI spends 3 percent of its sales on R&D but finds phasing out of old equipment critical over the next two to three years.\textsuperscript{180} Rs.600 crores is based on indigenous production\textsuperscript{181} Yet, Indian industries to not come up to the required level where components are concerned. This further creates lags in demand and supply. As earlier stated, collaborative

\textsuperscript{176} Op.cit.
\textsuperscript{177} ibid.
\textsuperscript{178} ibid.
\textsuperscript{179} Telematics India, vol3, no.10, July 1990, p.47.
\textsuperscript{180} Interview with U.D.N. Rao, Chairman ITI, 28 June 1994.
\textsuperscript{181} ibid.
agreements try to make up for this. There has also to be more emphasis on microelectronics in the telecom sector.

Despite the above facts with delicensing of equipment production and provision for private operation of basic telephony and value added services, the scope for a collaborative effort between India and US in this hi-tech area has increased tremendously. US companies have already set-up joint ventures for the provision of both products of both products and services in areas such as radio and mobile communication, cellular telephones, satellite communication, and a host of other value added services.

B) Microelectronics in India: The VLSI technology transfer has been started by the ITI with the U.S. firm ARCus in 1988 in a two phase implementation, the first costing Rs.20 crores and the second Rs.30 crores. It is expected to meet 25 percent of ITI's demand for the production of ASICs.\textsuperscript{182}

This was primarily done because the future of the semiconductor complex was still uncertain after the fire, which meant that India's dependence on exports had substantially increased. In 1990, ASICS worth Rs.100 crores were imported from the U.S. and Japan. The proposed VLSI project was primarily low and self reliant.\textsuperscript{183}

What is needed by ITI even more is R&D in microelectronics because:

a) it improves quality; b) cuts costs; c) is fuel efficient; d) non-pollutant; e) safe.

Any investment in micro-electronics will be well worth it.\textsuperscript{184}


\textsuperscript{183} Ibid.

\textsuperscript{184} Interview with A. Parbhakar, Executive Director, Micro-Electronics Div., ITI, 5 July 1994.
Micro-electronics in telecom technology is not just a "fancy" technology. It is the possibility of owning at low cost, according to A. Prabhakar, ITI Executive Director, 'Micro-electronics'. He felt that India was a decade behind the Asian Giants in this legend but was motivated to catch up within a year if VLSI was treated as an option and microelectronics manufacture begun. He also felt that the decision should not be postponed. Further, that it was well worth the price for VLSI transfer of technology cost and pricing. But, of course, micro-electronics technology has to be export-import related or else it will not develop.\textsuperscript{185}

Moreover, the Semiconductor Complex Ltd. (SCL) at Chandigarh is beginning to revive after the devastating fire on 7 February 1989.\textsuperscript{186} This resurgence is not due to any change in thinking or work culture in the organisation but the appointment of a permanent chief executive.

He is planning to rehabilitate the complex in two phases and his plan is to opt for maximum utilisation of this complex. This would then resolve a lot of the nation's electronics problem.

Microelectronics technology contributes to globalization and shaping of world economy. The microelectronics-based technological revolution plays a fundamental role in accelerating and strengthening the internationalization of national economies.\textsuperscript{187} It provides the infrastructure without which such a process could never take place. The role of telecommunications especially is important in this regard, to integrate and make possible the unified

\textsuperscript{185} ibid.

\textsuperscript{186} Times of India, (New Delhi), 25 August 1991.

management of spatially distant activities. In additions, new transportation technologies, much dependent on information processing for their effective operation, ensure a constant flow of commodities throughout the world.\(^{188}\)

Even more important for international competitiveness is the ability of countries and firms to sue high technology process in the production and management of traditional industries.

New technologies have constituted a powerful instrument in restructuring process insofar as they have enabled productivity gains without corresponding increase in employment and labour costs and have opened up new markets, particularly in high technology defence industries.\(^{189}\) ITI transfers important telecom technology to Bharat Electronics Limited (BEL) for defence purposes.\(^{190}\)

Therefore, it becomes even more important to trace and project the profile of Indian electronics of which both telecommunications and computers are integral parts N.Seshagiri calls it "communication" in which he outlines the emerging technology as that of the ISDN. He merged communications and computers and felt the future lay in both of these.\(^{191}\)

Some time ago, leading communication exports in the U.S. estimated that it would take an investment of $16 million a year over 30 year period for developing countries to bring their communication to the U.S. level.

\(^{188}\) ibid.

\(^{189}\) ibid., p.19.

\(^{190}\) IT Annual Report, 1988-89.

U.S. Telecommunication regime:

Meanwhile, the U.S. telecommunications regime continues to expand. Since the gap cannot be bridged except at very high cost, it is more viable for nations like India to priorities on aspects and segments of telecommunication, focus on them and develop operational areas. In this way, the lay will not seem unnaturally large.

Competition among producers from the developed countries encouraged a scramble amongst them for new markets. This scramble, along with the rapid pace of technological breakthrough and introducing of state-of-the-art technologies, caused dramatic declines in the prices of semiconductors computers, and other electronic equipment to the benefit of all users, including those in developing countries. Moreover, market pressure makes it difficult for firms to avoid the temptation of licensing their best technologies (inspite of wanting to protect their intellectual property), in order to gain an edge over their competitors. Thus, producers seem willing to make deals that could be advantageous for developing countries with large potential markets and for producers in developing countries, so far now especially in East Asia. However, with Indian changes in foreign investment policies linked with productivity and technological development enclosed in political stability, this scenario may change for the better as far as India is concerned.

193 Impact, no.70, 1990, p.23.
194 ibid.
Unfortunately, current competitive dynamics in high technology industries encourage a strategy of locating close to major markets, and major markets remain overwhelmingly within the developed countries.\textsuperscript{195}

But now, more and more as a result of competition among producers in the developed countries, locating production in certain developing countries has worked out as an attractive competitive strategy, as these offer inexpensive engineering talent; cheap components, a supportive infrastructure, tax, and regulatory environment, and the possibility of out-maneuvering northern competitors from third-country platforms.\textsuperscript{196}

Impact of Global Telecom Agreement And Information Technology Agreement Towards Technology Transfer

*Impact of Global Telecom Agreement*

The four engines which decide the growth of telecom industry are technology, political will, regulations & judicial activism and market dynamism. The Indian telecom industry must be able to have access to the latest technologies. The induction of technology should be encouraged by the government by speeding substantially the TEC approval process so that we do not delay by our red tape the benefits given by technology or prevent the growth of India as a major telecom player by a policy myopia. The political will is already ensured by the NTP 94 as well as the two agreements entered into by the government of India recently, namely the Global Telecom Pact (February

\textsuperscript{195} Op.cit.

\textsuperscript{196} ibid.
1997) the Information Technology Agreement (March 1997). The significance of these agreements deserve to be noted.

The recent global telecommunication pact (WTO) which was signed on February 15, 1997 is one more example of the international element of telecommunication which appears to be inseparable from telecommunication itself. Telecommunication, in the ultimate analysis is the capacity to communicate at a distance from one point to the world to another point. It is therefore natural that right from the beginning telecommunication has had an international dimension. The International Telecommunication Union is perhaps the oldest international body which is functioning today, having been founded in 1865.

The main highlights of the Indian offer in the Global Telecommunication Agreement are:

a) No change in 25 percent binding offer on foreign equity participation in telecom service companies.

b) Makes an additional commitment to review VSNL monopoly on international telecom services in 2004 and DOTs monopoly over national long-distance.

c) To participate in discussions over the Information Technology Agreement.

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197 FICCI, n.6, p.3.
199 ibid.
d) Adopts "85 percent" of principles laid out in Reference paper on regulatory framework for basic telecom services.

India has joined the 67 countries in signing the global telecommunication pact and we hope that this will have a positive impact on the telecom industry.

Ending government and private monopolies that still control the industry in many countries would bring rapid growth over the whole telecom sector and could add $1 trillion - or four percent - over the next decade to the value of world economic output. For the first time, the telecom pact will bring services like basic telecom, cellular phone services, satellite systems, data transmission and paging under the WTO and its dispute settlement system. The commitments made by countries on allowing foreign equity in telecom services, companies varied greatly, but were unanimous in opening up of domestic markets. There were offers ranging from ten percent to 100 percent (foreign equity) at the negotiating group talks. But the key was that there was a move to open up home markets. The negotiating group on basic telecom talks broke down in April last year after the US withdrew from the discussion because countries like Malaysia and Indonesia had not even tabled offers. Indian officials made no significant changes in the country's offer tabled at the NGBT talks in April last year. The country retained a binding commitment of 25 percent foreign equity in telecom service companies in its offer. Earlier there were indications that India would increase its offer to 49 percent.

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200 FICCI, n.7, p.20.
202 ibid.
ownership. India already allows 49 percent - up to 74 percent if the holding company route is adopted - foreign ownership. A binding agreement means that India cannot reverse the decision ever in future without the risk of inviting hefty sanctions. The only change made in the Indian offer was an "85 percent" acceptance of the principles laid down in a "Reference paper relating to regulatory framework for" basic telecom services. Indian negotiators did not commit the country on a safeguard that countries would not engage in "anti competitive cross subsidisation". Charlene Barshefsky, US trade representative told a press conference in Washington that the $600 billion dollar telecom industry will double or even triple in the next ten years under this agreement."203

The global telecommunication pact is good news for the Indian telecom users because it commits the Government of India to review the monopoly in long distance services by 1999 and international telecom services by 2004. In fact in the context of article 19 of the Constitution if the monopoly of the department is challenged in the court, the monopoly may have to be given up even earlier than the date committed in the global telecommunication pact. The commitment for pluralism in the telecom sector internationally is also a welcome measure because the Indian consumer can hope for the normal market dynamics to operate. Greater competition is the only guarantee for their services and lowering of tariffs.204

Thanks to the pact, public sector telecom monopolies can breathe easier till 1999 and till 2004 so far as VSNL, is concerned. In view of the potential

203 ibid.
204 FICCI, n.6, p.8.
vulnerability of Section 4 of the Indian Telegraph Act 1885, if there is an activist consumer movement the monopolies may go even earlier. In the light of the Supreme Court judgement in the Hero Cup case, this becomes a distinct possibility.\textsuperscript{205}

The strategy adopted by the government to bind themselves only to 25 percent in the global telecommunication pact while in practice even more foreign equity is permitted, is in a way prudent measure. The government in the light of the National Telecommunication Policy has been pushing systematically towards greater competition in this sector. Nevertheless, if there are some unexpected developments and there is a backlash against the opening of the telecommunication sector then this commitment of 25 percent will come in handy for the Government of India to reverse policy without having to lose face in the international scenario.\textsuperscript{206} In this connection, it will be worthwhile to recall also how some of the very effective and well known practitioners of the liberal market economy like Soros have been raising their voice of caution against the excesses of free market economies. In our democratic system also there will always be pressures for greater government control. If the pressures of populism become inevitable, then this 25 percent commitment provides a safety valve to the government of the day. However, agreeing for 25 percent in the global telecommunication pact, while being liberal in practice will send the right signal that the Indian bark of

\textsuperscript{205} ibid.

\textsuperscript{206} ibid.
protectionism may be worse than its life. After all, action speaks louder than words.\textsuperscript{207}

Infact, the only way Indian companies will gain from this global telecom pact is by globalising. India must encourage the companies to grow into multinational companies. Our large country with 21 circles provides an excellent opportunity to develop home grown Indian companies to become capable of operating at global levels. If the present restriction about the number of circles in which the private service providers can operate is removed, it will be the first step towards making the Indian companies in the domestic market, grow to global dimensions, and, then take on the emerging global market which is expected to go to more than a trillion dollars.

"The reason why capping was introduced by the Government was to prevent a monopolistic control on the telecom infrastructure of India by powerful giants with sufficient financial strength and to permit middle scale players to play a role. In today's situation, where only the competent players will survive and lot flushing out of those who are in-capable of husbanding the needed resources in terms of man, material and money, will take place, we will possibly have a situation where duopoly may be allowed to evolve into multiple operators service, hence though capping may have been the right approach but in today's circumstances a policy change is needed. In fact the introduction of the concept of capping the circles has turned out to be a retrograde step because it upset the economies of the investors. Thus even from the point of view of improving the quality of services, the removal of the restrictions on the number

\textsuperscript{207} ibid.
of circles in which a private service provider can operate brooks no further delay".\(^{208}\)

**MOTIVES OF THE U.S TO TRANSFER TELECOMMUNICATIONS TECHNOLOGY**

No doubt, telecommunication has imparted change in business, trade and industry, education, healthcare, Banking and retail systems etc.\(^ {209}\) yet,, there are some areas where telecommunication has brought some amount of problems. These areas pertains to national security in the international relation framework. The new telecommunication technologies provide new capabilities and applications in microelectronics, photonics and military system along with analog and *** computers, microwave and signal processing which had earlier applied themselves in military systems.\(^ {210}\) Thus the important point is that in high technology, military and civil applications become symbiotic and because of these symbiotic relationship, a hitch of its gets created in the process of smooth technology transfer.\(^ {211}\)

Now, there is a common purpose pertinent to information technologies to provide users with the information they want, when they want it, and in the desired form. The potential application are as numerous as the sources of

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\(^{208}\) FICCI, n.7, p.25.

\(^{209}\) ibid.

\(^{210}\) The Times of India, (New Delhi), 5 April, 1991.

\(^{211}\) ibid.
information available in a society; thus, which application will emerge will depend on factors other than technology.\footnote{212} Mainly two factors determines the above application of information technology vis-a-vis telecommunications viz- as policy making of a nation and b) relation between nations.

Because of these factors having national and international impact it is essential to analyse the motives of the technology suppliers in telecomm to developing countries and is our case the motives of U.S. towards telecom. transfers.

Motives of the U.S. to Transfer Telecommunications Technology

1. It is perceived as the U.S. interest to help friendly developing countries.\footnote{213} Telecommunication technology can help speed up advancement of developing countries. yet the U.S. model or transfer may not be totally appropriate for India. The opportunity does exist to develop basic and specialized services, together and in combinations that are most appropriate to the needs and desires of each country.

2. The U.S. perception is that it continues to place high importance on maintaining a free and open society-technologically and commercially competitive.\footnote{214}


Modern telecommunications make political boundaries essentially transparent and U.S. telecommunications transfers almost imperative to improve the quality of life.

3. Telecommunications technology, according to the U.S., should continue to contribute positively to the international balance of trade.215

A leadership role in telecommunications technology is a prerequisite to a strong international market position. Because of established relations between governments and their telecommunications industries, markets for telecommunications network equipment are among the most restricted in the world.216

The pervasiveness of telecommunications technology does affect the trading positions of the U.S. vis-a-vis countries with which it shares its technology.217 The U.S. wants to maintain its technological leadership; hence, transfer of technology is only to this end and has sometimes introduced "time lag" into the transfer of technology process, but this approach risks the loss of market opportunities if others are willing to trade long term opportunities for short term projects.

Thus, the tendency to require surrender of technology as a condition of market entry is developing into an issue demanding U.S. government attention.


217 Ibid., pp.13-22
4. According to U.S. perceptions, worldwide technical standards must be developed expeditiously and in a politically unbiased way.

These standards are critical to the evolution of the information age and have to be firm enough to ensure compatibility between old and new products and wide enough to ensure rapid introduction of new technology.\(^{218}\)

These questions are highly political. A major challenge to be met rapidly would be to separate the technical from the political. The pace of technological change is such that rapid resolution is essential if society in general is to receive the maximum benefit from the technologies being developed. Also, the competitiveness of the U.S. behoves it to have an effective voice in discussions on international standards.

5. The telecommunications industry will continue to support the national security and defence needs of the U.S.\(^{219}\)

The U.S. underlying critical technology is vital not only for military and emergency preparedness communications, but also for military command and control functions, referred to as C\(^3\)I,\(^{220}\) which is the core of military effectiveness (as seen in the recent Gulf war). It affects U.S. security and defence needs. This ubiquity of telecommunications technology underscores the U.S. need for technological international leadership. It also poses the difficulty of implementing an appropriate export policy for both technology and products.


\(^{219}\) Ibid., p.14.

\(^{220}\) Ibid., p.15.
Telecommunications technology is capital intensive, both for R&D and for manufacture. A clear and stable trade policy with appropriate export controls, according to U.S. policy makers, with industry-government interaction will make better ground for international competitiveness.\textsuperscript{221}

Since telecommunications services themselves are directly critical to national security, they are key elements in programmes for verifying demilitarization and thereby provide a mechanism for maintaining peace as well as military effectiveness.

In the U.S. perception, improving the flow of technology War' Accomplishing that means dealing with a fundamental management problem, the complex task of finding a method for shepherding an idea from economics, government policies, law and most of the information technology, i.e., telecommunications and computer technology, does transfer from U.S. national military technology to civilian industrial technology under the dual use technologies and therefore, the involvement of the U.S. government is high. This further involves the U.S. legislative acts in controlling and guarding technology. The 1965 Brooks Bill and its successor the 1982 Paperwork Reduction Act, introduced an administrative swamp that delayed the government itself from using state of the art technology and imposed on each federal agency the requirement to institute complex bureaucratic systems to monitor and manage their data processing systems.\textsuperscript{222}


Other government acts of some consequence came in 1981, with the U.S. versus IBM anti-trust suit and also the consent decree imposed on AT&T in their case with the government. Both of these cases throttled the pace of innovation, for example, IBM’s generosity toward universities during the 1970s was severely curtailed and AT&T was compelled to stay out of the computer business for some time.\textsuperscript{223}

The Privacy Act, Presidential Directives, and other bills, from 1974 to date have been useful in protecting citizens rights and imposing more users. But, along with the consequences of the brooks Bill, the cost in reduced technology transfer has been enormous. Transferring telecommunications technology requires that marketing people must be in the country of sale. Therefore, geographic dispersion does not really help. Transferring technology is an awkward and tedious process.\textsuperscript{224}

6. It is important of the United States from the preceding points to retain a position of leadership in the sciences and technologies underlying telecommunications.\textsuperscript{225}

To retain leadership, those telecommunication technologies that are important either to national security or to international competitiveness and sometimes both, entail not only adequate R&D but also adequate mechanisms, such as manufacturing technologies, for converting the resulting science and

\textsuperscript{223} Ibid.

\textsuperscript{224} Ibid., p.56.

technologies, base into competitive projects and services. Unless governmental policies support this objective, there will be no advancement.226

However, a policy of primacy does not preclude a policy of cooperation. Thus, there should be opportunities not only within the Western alliance which is taken for granted, but also with developing countries like India to share in the development and use of new telecommunication technologies. Such cooperation would also be a tool for improving India-North and North-South relations.227

Thus, it would seem that leadership in telecommunications is a useful adjunct of effective foreign relations, since the ultimate objective of both is to improve the quality of human existence and in the larger framework, international relations.

7. It is the U.S. perception that the intellectual property rights of U.S. nationals be adequately and effectively protected throughout the world.228

This, of course, means that robust intellectual property projection fosters transfer of technology by facilitating licensing, disclosing innovations and creating incentives to publish research results. Access of local firms to new technology is thereby increased which, in turn, fosters economic growth.229

On the positive side is seen a causal linkage by the U.S. between the presence of efficient property rights, including intellectual property rights and

226 Ibid., n.54.
229 Ibid.
economic modernization, patents are supposed to encourage private innovation. Innovation creates technological change, which is the main engine of economic development.²³⁰

Technology for a long time has been regarded as a "free good",²³¹ Therefore, the other side of the argument from the U.S. is the "technology is a part of the universal heritage of mankind" and the patent system should be dismantled over the world, releasing all proprietary knowledge and "low cost" transfer to developing nation.²³²

Yet, by a well known statistical process, the regression analysis, it is found that the level of economic development correlates closely with the level of patent protection; nations with stronger patent systems experienced more rapid economic development. This happened for three reasons: First, well developed patent rights foster economic growth, so that nations that upgrade their intellectual property rights system can expect improvements in the rate of innovation and investment in innovative activities. Second, inadequate property rights impede economic development. Weak patent regimes can be expected to correlate with economic backwardness. Third, as economic development occurs, it makes patents and other intellectual prospects for sales and profits from their exploitation.²³³

²³⁰ Copyright Protection for International Property to Enhance Technology Transfer, Hearing before the subcommittee on science. Research and technology 101st congress Washington D.C. 1990, 26 April 1990 no.117.
²³² Ibid.
²³³ Ibid., n.63.
India, Barazil and Argentina are among the weak protection regimes, despite the size and complexity of their economies. There is insidiousness in this regard as developing nations themselves for the most part cannot protect their industry from infringement and would also like to pool in and transfer technology at low cost since most technologies are used over and over again even through the "right" in intellectual property rights involve trade-marks, patents, copyrights and other protective forms (royalties, licensing fees) governing industrial and artistic creations. It is becoming relatively easier for recurring infringement and easier reproduction to take place.

Software piracy has assumed immense proportions, of the roughly $50 billion market for software in the U.S. alone, approximately 5 billion is illegal software. According to a U.S. Department of Labor study in 1987, rampant software piracy has been noted in the Philippines, Thailand, Malaysia, Indonesia, Mexico, Argentina, South Africa, India, apart from the "Four Tigers", Hong Kong, Singapore, Taiwan and South Korea.

The world software industry loses approximately U.S. $5.7 billion in sales due to piracy. Of this, the U.S. market alone lost $4.1 billion in gross revenues in 1986. The International Trade commission study conducted in 1987 covered global hardware and software industry. It surveyed 47 computer manufacturing companies and 52 software developing firms found that up to 95 percent of the software pirated was of U.S. origin. The major offending countries included the four Tigers, China, India, Indonesia, Japan, Mexico and

234 Ibid.
235 Ibid.
236 Business India (Bombay) 22 August, 4 September 1988, p.144.
Thailand. Of these, only Hong Kong took corrective action and has not come onto the U.S. hit list.\textsuperscript{237}

India did not figure prominently in the Department of Labor study, not because the levels of piracy were lower, but the levels of computerisation itself were considered too small to make it an issue of international concern.\textsuperscript{238} Yet, there is a lot of insecurity of India's potential in the software market.

To stem these very infringements, an effort was made in the 1970s at the General Agreement on Tariffs and trade (GATT) to draw up an international code. It failed to get enough support. A second effort in the late 1970s led by U.S. business sectors resulted in patents and copyrights being covered by the international code.\textsuperscript{239} There was a strong feeling that the existing international institutions concerned with intellectual property matters, and particularly the World Intellectual Property Organisation (WIPO) should be able to handle the problems.\textsuperscript{240}

In the September 1986, the GATT meeting in Punta del Este, uruguay, agreed, among other things, to include intellectual property on the GATT agenda for the 1988 Uruguay Round that would shape international trade relations for the rest of the century.\textsuperscript{241}

\textsuperscript{237} Ibid.
\textsuperscript{238} Ibid.
\textsuperscript{239} Ibid., n.61.
\textsuperscript{240} Ibid.
\textsuperscript{241} Ibid., p.8.
Less satisfactory to the U.S. private sponsors were signs in mid-1987 of a weakening of what had seemed to be a growing support in other developed countries.

Not enough progress has been made since then in the U.S. view, especially the February 1988 report, when U.S. International Trade Commission arrived at larger than expected losses. The U.S. industry incurred losses from $10,000 to $5,000 million for individual firms; the aggregate came to $23,800 million.²⁴²

Of the 167 firms that provided data on estimated losses, the largest amount was in the scientific and photographic industry. Next were 25 firms in the computer and software industry ($4,100 million), 11 firms in electronics ($2,300 million) followed by losses in manufacturing entertainment industry, video recording and pharmaceutical firms.²⁴³

With the signing of the Global Telecommunication Pact in Geneva on 15th February 1997, India has opened up its market for basic telecom services. In fact this pact has opened up $600 billion World's Telecommunication Market, and expected to domestic or even triple over next three years. Liberalising telecom would boost the income of the industry by about US $1 trillion over next decade or in other words, around 4% of the total current global economic output.²⁴⁴

Towards this effect, from 1st Jan 1998 as this pact comes into force, the quintest beneficiary will be U.S. followed by Japan and EU. It is believed that

²⁴² Ibid.
²⁴³ Ibid.
for big telecom investment companies, it would bring predictability and stability to the market, thus if this trend continues then more of U.S. technology should flow to India either in the form of FDI (Foreign Direct Investment) or direct techno-transfer.245

Through U.S. tried to prevail upon Japan and Canada to enhance the level of foreign equity of telecommunication companies yet Canada remained a demand to 46.7 percent. While the U.S. offer was 100 percent. India’s offer was around 25 percent. Towards this effect DOT said, this offer of 25 percent does not mean denial of market access to foreign players.246

In activating India’s policy permits 49 percent of foreign equity and upto 74 percent foreign equity through bypass roote of holding companies. In contrast to this agreement of caping 25 percent foreign ownership in the accord appears to be confusing.247

Thus, the WTO - global telecom pact has resulted into U.S. and its allies favour, thus, it should give boost to India's impact of technology in the telecom industry and information technology as a whole.248

A peculiar situations one gets to witness when U.S. complains about the Indian Government’s move to limit the member of operators in the telecommunications sector. On the recently concluded CII (Confederation of Indian Industries)249 Seminar on Telecom Regulation - 2000 and beyond 1997

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245 Ibid.
246 Ibid.
- the Chairman of the U.S. Federal Communications Commission (FCC). Reed Hudnt questioned the Indian move - "There is no reason for limiting or for limited member of licences, except in the field of wireless communication (to prevent interference)". His emphasis was on "competition and communications" would be the key to success in 21st century.250

But the fact is this competition is in those sector of telecom industry where India may not be in a very much needy situation to impact or insist for the transfer of technology. The areas where India expresses its needs for technology transfer, U.S. user its parameters of economic viability or profitability and its inherent political motives. These motives often gets substituted by complains of IPR (Intellectual Property Rights) violation or MTCR etc. The recent case of imposing ban on BHEL and IIS (Indian Institute of Sciences) and other on the pretext of missile proliferations. There are numerous examples like it. One will hope that information technology agreement and telecom pact will brighten the situation of techno-transfer between U.S. and India.

250 Ibid.