

REFORMS IN TELECOMMUNICATIONS: US AND INDIA

**Dissertation submitted to Jawaharlal Nehru University in partial
fulfilment of the requirements for the award of the degree of**

MASTER OF PHILOSOPHY

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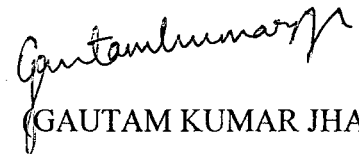
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CERTIFICATE

This is to certify that the dissertation entitled “**Reforms in Telecommunications: US and India**” submitted by me in partial fulfilment of the requirements for the award of **Master of Philosophy** has not been previously submitted for any other degree of this or any other university.


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Chapter 1

Introduction

During the last two decades there have been dramatic changes in most aspects of the telecommunications industry. The industry has become more complex with digitalization, introduction of new products and coming together of broadcasting, information technology and telecommunications industry. These developments have been accompanied by legislative and regulatory reforms and increasing presence of independent regulatory agencies (The Telecommunications Act of 1996 in US, The New Telecom Policy of 1999 in India are examples). The major role of the regulatory agencies has been to determine the process of competitive interface between the incumbent operators and the new entrants.

It is widely believed that free market competition enhances productive efficiency of companies in network industries like telecommunications, with competition increasing the variety of products and services being offered and also stimulating technological innovation. An important question that then arises is how to go about the competitive transition of network industries like telecommunications. More often than not, the regulators have tried to manage the competitive transition to determine a competitive outcome. This, paradoxically results in increased regulation in the market along with increased administrative costs and market inefficiencies. This is not to say that regulation is bad. But such kind of an approach by the regulators often results in a market that is neither competitive nor regulated and the benefits of competition that should be accruing to the consumers, does not materialize.

For decades, telecommunications services have been provided either by a secure monopolist or by a public enterprise (in most of the world, including India) or by a private regulated corporation (AT&T in the US). The absence of competition was due to the fact that, there existed large fixed costs in large part of the network, whose duplication was neither privately profitable nor socially desirable. The

telecommunications industry was said to be a 'natural monopoly'. The issue whether the telecommunications industry is a natural monopoly or not has a long history. The essential institutional result has been the perceived need for regulation if a natural monopoly situation exists. Let us first discuss the distinction between three concepts: monopolization, actual monopoly and natural monopoly.

In discussions about network industries, like telecommunications, monopolization, actual monopoly and natural monopoly are often used interchangeably. Monopolization refers to company behaviour aimed at achieving a monopoly irrespective of the fact that whether the company is successful or not. Actual Monopoly refers to the market position of a company having no established competitors, although there may be potential entrants. Natural monopoly refers to technology and market conditions. In other words, there is said to be a natural monopoly if a single company can supply the amount demanded by the market at less cost than two or more firms. Antitrust policy targets monopolization behaviour only. In order to remove simple monopoly, governments have used incentives for entering firms so that they can provide competition. Also, legislative measures have been enacted to control simple monopoly in a market.

One of the most important technological features of the telecommunications industry is the network economies associated with it – the larger the network, larger are the economies associated with it. However, a small operator can gain much from interconnection with other larger operators. It is because of this asymmetry that regulators are used to police and enforce interconnection. But if a small operator does not want to interconnect, regulation is not required. However, the existence of an isolated local system (closed user groups for offices and buildings) is considered irrelevant while discussing interconnection and hence regulation because the telecommunications industries, in most countries, have moved from monopolies to oligopolies.

Telecommunications services will refer to two-way transmission of information, including voice, text, audio and video, between parties that are not in physical contact with each other. Consumers purchase these services from telephone companies, which include local, long-distance, wireless, cable and internet providers. Telephone services include local and long distance calls, wireless, voice mail, caller ID, directory assistance etc.

In the early 20th century many industries, like telecommunications, electricity, etc., were viewed as natural monopolies. These industries either required heavy capital investment involving a long gestation period, which gave the firms within that industry a monopoly or they had high last-mile costs, which the early entrants an advantage. Governments regulated these firms so as to not only prevent them from making monopoly profits and thus treat the customers fairly but also to prevent these firms from allowing to cross-subsidize their high cost products with the earnings from the low cost ones. Regulation was mostly limited to allowing the incumbent to earn a rate of return that just exceeded the cost of capital. However, regulated monopolies turned out to be inefficient and hence came the idea of competition.

Introduction of competition in the telecommunications industry is a recent phenomenon. Although its introduction has been primarily due to change in policy objectives, i.e. from security to efficiency and from being a luxury to mass consumption, its spread has been primarily due to technological advances, especially the advances made in data transfer through fibre optics and increasing use of wireless technology. As long as transmission was through wires, last mile costs were so high that no competitor could lay a parallel network and compete with the incumbent. Hence, to introduce competition governments would create price discrimination in favour of wholesale retailers leasing lines from the incumbent monopolist. However, these wholesalers were often not successful because their own cost structure was similar to that of the incumbent. Meaningful competition in telecommunications arrived after the advent of wireless services and with the growing demand of Internet services. Wireless services removed the last mile hurdle. As the subscriber base

increased, the cost of connecting a cellular subscriber decreased, much below the levels of wireline services under the same circumstances.

Telecommunications is a capital-intensive service, not only in the sense that it is highly automated and requires less labour but also in its large capital requirements. This feature has been used as an argument for attracting foreign investment. However, capital requirements are high if there are few operators in the market with capital needs such that they cannot be generated domestically. If the number of service providers is sufficiently high, as in a competitive framework, their individual capital requirements would be much lower and could be managed domestically. Competition in industries may lead to failure of firms in that industry. If customers of failing firm are to receive continuous service then that requires that failing firms are taken over. Thus, there needs to be an active market for firms with easy access to funds to purchasers. In effect, the size and degree of competition in the capital market determines competition in the market.

Antitrust policy in US played a significant role in the development of telecommunications industry over the course of last century. Even though the role of competition, technological change and State regulation have been significant and are duly acknowledged in the literature, antitrust intervention changed the development trajectory of the telecommunications industry in US at critical junctures. In US, the Courts and Department of Justice viewed natural monopoly as a potential anticompetitive behaviour, while focussing on monopolization behaviour. However, natural monopoly technology does not preclude or prohibit competitive entry even if the production by a single firm is considered to be efficient. If an incumbent firm sets prices above costs, the entrants can compete for customers.

The telecommunications industry involves large fixed costs, especially in the establishment of the network system. Avoiding duplication of such facilities has been an important part of the natural monopoly argument for regulation of the local

exchange. The argument is that since duplicating transmission facilities does not minimize the costs, regulators should bar the entry of competing carriers. The 1996 Act implicitly assumed that the local exchanges in US were not a natural monopoly because it breaks the regulatory barriers to entry. It, thus, overturned the approach of the Modification of Final Judgement (MFJ), passed in 1984.

The thrust of the Telecommunications Act of 1996 was to allow for the formation of companies that could offer a large array of complementary services like long distance, local, multimedia, Internet services, etc, to the consumers and act as single shop for all the services. In a nutshell, the 1996 Act aimed at promoting competition in local markets and enable the Regional Bell Operating Companies (RBOCs), formed after the divestiture of AT&T in 1984, to enter the long-distance market once the local markets were sufficiently competitive. The key focus of the Act of 1996 was the creation of competition by the Competitive Local Exchange Carriers (CLECs) to remove the Incumbent Local Exchange Carriers (ILECs) ability to use their bottleneck monopoly (the last mile problem) to obstruct competition in various segments of the local market. The 1996 Act also provided for the access to the network systems by mandating interconnections, use of existing network elements and resale of wholesale services, so that the problem of duplication of services is addressed. The 1996 Act attempted to enhance competition wherever it existed and to establish it where it did not.

The Telecommunications Act of 1996 replaced the regulatory framework of the 'natural monopoly' era with a radical deregulatory approach that promised new consumer benefits through competitive forces both, in the local as well as the long-distance market. The Act of 1996 gave Federal Communications Commission (FCC), the regulator in US considerable discretion in implementing the Act's provisions. The many successful judicial challenges to the FCC's interpretation of the Telecommunications Act of 1996 created an ambiguity in the market. The advent of the Internet age created an environment where large sums of money were invested by corporate executives in order to gain from the riches that the Internet age promised

to bring. This inevitably led to overinvestment, especially in laying down the fibre optics, thereby leading to generation of excess capacity. When the telecommunications stocks plummeted in 2000, the industry lost close to \$ 1.4 trillion with many companies filing for bankruptcy. Instead of competition, there was consolidation in the telecommunications industry with companies either merging with or acquiring other companies to protect their interests.

The Indian telecommunications industry has been a government controlled monopoly for the most part of its evolution process. Like most colonies, India, after independence inherited a telecommunications network that was essentially concentrated in some cities across the country. British precedents were particularly influential since the Indian Telecommunications Services was initially run in the same way as Britain. For most part of the 19th century Indian telecommunications industry was a Post, Telephone and Telegraph model and telecommunications sector came under the Ministry of Posts and Telegraph. The ministry used to cross-subsidize its postal services from the profits it earned from telecommunications.

The Indian telecommunications organization was designed to preserve its monopoly. Its main arguments against competition were the provision of rural telephony and that of a welfare state i.e. to provide cheap and easy access to telecommunication services for the population. To give sanctity to these objectives over a period of time it installed telephones very slowly. The waiting list for telephones continued to increase. Further, the policymakers viewed telecommunications utilities as luxury goods. Consequently, no separate attention was paid to build infrastructure in telecommunications in the Five Year Plans.

With the separation of telecommunications from posts in 1984 and the creation of Department of Telecommunications (DoT), telecommunications' cross-subsidy to postal services ended. Reforms in the telecommunications industry started from the 1990's when metro cellular licenses were auctioned. However, the legal imbroglio over this auction meant that the licensees could only start their operation from 1995. It

was not that DoT had changed its views regarding competition. It viewed mobile services as value added services and looked at it as an opportunity to make additional profits. However, as the waiting list for telephones continued to increase, the government announced the National Telecom Policy in 1994, to pave way for private investments in telecommunications. Further new licenses were issued in 1995 as per the National Telecom Policy of 1994. The licensing conditions and the tariff structure were such that none of the private telecommunications operators were able to perform well. Further, the change in demand conditions of telephones made private operators unviable.

India set up its regulator, the Telecommunications Regulatory Authority of India in 1997. However, the provisions of TRAI were loosely formed and when TRAI tried to make changes in the tariff structure, it was challenged by DoT in Courts which severely damaged the TRAI's regulatory functions. The private operators were at the brink of financial collapse by 1999. Most of them had bank guarantees from prominent government financial institutions and the threat to cash their bank guarantees would have severely damaged the resources of these banks (as cellular companies had hardly built any assets). To resolve this impasse, government introduced the New Telecom Policy of 1999. It also set up a Telecom Disputes Settlement and Appellate Tribunal (TDSAT). The provisions of the New Telecom Policy were able to save the private operators.

The provisions of the licensing regime in Indian telecommunications encouraged foreign investment in Indian telecommunications. The argument given was that Indian companies should have foreign partners who have experience in telecommunications to provide the required technical assistance to the former. Also, government was of the view, that it was not in a position to invest heavily in telecommunications as the demand for telephones had increased substantially and hence private players were necessary. The initial limit of foreign direct investment was put at 49 percent. In 2005, it was increased to 74 percent. This indirectly helped the GSM operators who were largely dependent on foreign capital. Over the years India has moved to a

universal licensing regime, which has eased the conditions for new licenses and in effect helped the bigger industrial conglomerates in acquiring most of the licenses across the nation.

While the regulator was defanged initially by the incumbent and the tribunal and most of the provisions of licensing favoured the bigger industrial houses, Indian telecommunications has come a long way to become one of the fastest growing markets in the world. The monopoly of the incumbent has decreased, availability of telephones has improved and so has teledensity, though most of the growth in telecommunications has been led by the wireless segment. However, this is true for the urban areas only. Rural penetration, though improved in recent years, still continues to be dismal.

Introduction of competition is new to Indian telecommunications. Unlike the US telecommunications industry, which was well developed, the Indian telecommunications industry was in placid backwaters. When competition was introduced in telecommunications in US, it led to a spectacular boom and bust with lot of failures leading to consolidation. While the consolidation process is also true in the Indian case with the industry increasingly becoming an oligopoly, Indian telecommunications industry did not see the boom and bust cycle as was seen in most of the OECD countries. One of the possible reasons for it can be the role played by the regulator and the government in easing competition so that the incumbent could change its tariff structure gradually and hence ease into competition. Also, the huge market that India provides had kept high the demand for telecommunications services. With new value added services, like Internet and broadband facilities, being introduced one could see further growth in the industry.

While one saw overinvestment, largely due to incorrect projections in demand for Internet, leading to generation of excess capacity and hence failure of many telecom firms, this may not be true for Indian telecommunications services. Our task is to

analyse the reform process and the regulatory environment that has led to remarkable growth in the telecommunications industry in India. This paper is further divided into four chapters. The second chapter looks at the US telecom crash. The third chapter looks at the reform process in Indian telecommunications industry while the fourth chapter looks at the rural-urban divide in Indian telecommunications, looking at the policy initiatives which gave rise to this rural-urban divide and also the policies that have been introduced to correct this digital divide in rural areas, which may be the driving force behind the growth of telecommunications industry in India. The concluding remarks are given in the fifth chapter where we analyze the reforms in both US and India and try and point out the essential difference in which reforms were carried out and competition was introduced in the telecommunications sector of both the economies. We also try to determine the causes of the digital divide in Indian telecommunications. Some policy prescriptions to reduce this digital divide are also discussed.

Chapter 2

Analyzing the US Telecom Crash

The turn of the century saw a “boom and bust” investment cycle in the industries of information and communication technology of most OECD countries. This is particularly true for the telecommunication sector, in which capital spending increased sharply in the 1990s, especially in the latter half of the 1990s, after the governments opened the market to new entrants. There have been ups and downs in the telecommunications industry in the past decade. The industry has become more complex with fixed lines, mobile networks and with the expansion of internet and broadband services. Since 1998, data has accounted for well over half of all telecommunications traffic.

Liberalization of the telecommunications industry has not only led to more players in the field, more innovations and more competitive prices but as the air went out of the telecom bubble in the early 21st century, it has also led to one of the greatest collapses in the modern corporate history. In March 2003, Deutsche Telekom, Europe’s biggest telecommunications operator, reported a net loss of 24.6 billion euro, the largest in European corporate history till then, Vodafone presented the largest annual loss in British corporate history in 2002 and France Telecom then had the largest corporate debt in the world, amounting to US \$ 70 bn. The telecommunications industry in US lost \$ 1.4 trillion when stocks when the stocks plummeted in 2000. As a share of total employment, telecommunications employment fell from 1.2 percent to 1.0 percent from March 2001 to July 2003. We now proceed to analyze the telecommunications crash in US.

Change in the Regulatory Environment: The US Telecommunications Act 1996

Telecommunication has traditionally been a regulated sector in the US economy. The telecommunications sector in US is regulated both by the federal government through

Federal Communications Commission (FCC) and by all the states through a Public Utilities Commission (PUC). By the beginning of the 19th century it was evident that telecommunications markets were not natural monopolies, as evidenced by the existence of more than one competing firm in many regional markets. However, later most of them were clubbed with the Bell System. In the course of time it was realized that some markets that may have been natural monopolies are not natural monopolies now and that it would be better to allow competition into those markets while keeping the rest regulated.

The market for telecommunications equipments and telecommunication services went through various stages of competitiveness since the invention of the telephone by Alexander Graham Bell. After a period of expansion and consolidation, by the 1920s, AT&T had control of majority of telephone exchanges and submitted to state regulation. Federal regulation in US was instituted by the 1934 Telecommunication Act, which established the Federal Communications Commission.

Telecommunications services will refer to two-way transmission of information, including voice, text, audio and video, between parties that are not in physical contact with each other. Consumers purchase these services from telephone companies, which include local, long-distance, wireless, cable and internet providers. Since most of the companies offer a range of these services, division between these above mentioned categories has become increasingly unclear. Ever since the provisions of telecommunications services became less monopolized after the breakup of AT&T, firms producing intermediate services have occupied important role in the industry.

Telephone services include local and long distance calls, wireless, voice mail, caller ID, directory assistance etc. The technology consisted of the copper local loop¹, fibre network for long distance and switching facilities that route calls along the network.

¹ Copper local loop is the portion of the lines connected directly to the house or business establishment.

Wireless service was originally organized by FCC as a duopoly. It reserved one license for the Local Exchange Carriers (LECs) and auctioned the other. Internet service is available from local phone companies, cable companies and other providers such as AOL. Dial-up access allows users to connect to the Internet through phone lines. Digital Subscriber Line (DSL) service also travels over the local loop, but is much faster than the dial-up access. Cable companies also offer high speed services over their network.

Regulations in the US telecommunications market was marked by two important antitrust lawsuits that the US Department of Justice (DoJ) brought against AT&T². In the first one, *United States vs Western Electric*, filed in 1949, DoJ accused the Bell Operating Companies of practicing illegal exclusion by buying only from Western Electric, a part of the Bell System. Though the government wanted a divestiture of Western Electric, the case was settled in 1956 with AT&T agreeing not to enter the computer market. AT&T, however, retained the ownership of Western Electric. This lawsuit marked the first instance where the regulator had used the antitrust laws to control the monopolizing behaviour of the incumbent.

The second major antitrust suit was *United States vs AT&T*, which started in 1978. The government alleged that the relationship between AT&T and Western Electric was illegal and that AT&T had monopolized the long distance market. DoJ sought divestiture of manufacturing and long distance from local services. This case was settled through a Modified of Final Judgment (MFJ). This resulted in breaking away from AT&T, seven Regional Operating Companies (RBOCs)³. Each RBOC consisted of a collection of local telephone companies which originally were a part of AT&T. Also, the RBOCs remained regulated monopolies with exclusive franchises in respective regions.

²Economidies, N (2004): "Telecommunications Regulation: An Introduction", NET Institute, wp #04-20.

³ *Ibid.*

With the breaking up of AT&T in 1984 it was realized that competition was possible in long distance with the local market remaining a natural monopoly. Benefits to the consumers came largely from the long distance market which transformed from a monopoly to an effectively competitive market. The market share (in minutes of use) of AT&T fell from almost 90 percent in 1984 to about 53 percent by 1996 and further to less than 40 percent by 2001⁴. Between 1984 and 1996, the average revenue per minute, of AT&T's switches, reduced by 62 percent. This can be seen in Figure 1.1. AT&T was declared non-dominant in the long distance market by FCC in 1995⁵. It is widely agreed upon that presently the long distance market is widely competitive in nature.

After the MFJ competition in the long distance market increased dramatically. Up to 1996 there were four large facilities-based competitors in the long distance market – AT&T, MCI-WorldCom, Sprint and Frontier (formerly Rochester Telephone). After 1996 a number of new large facilities-based competitors entered, including Qwest, Level 3 and Williams. There was also presence of large number of 'resellers'⁶. Prices of long distance calls also decreased dramatically. Long distance prices, both international and domestic, approximated by average revenue per minute, fell by approximately 32 percent between 1993 and 1998 (Figure 1.2). Also, domestic long distance prices, relative to other goods and services fell by 10 percent between 1993 and 1999⁷. Figure 1.3 shows the price indices for telephone services in US. Measuring by the consumer price index (CPI), prices of long distance fell 18.5 percent from December 1997 to March 2003. Prices for local services rose 21.7 percent over the same period.

⁴ *Ibid*

⁵ FCC., (1995).

⁶ Resellers are those who buy wholesale services from the facilities-based long distance carriers and sell to consumers.

⁷ Kennard, W. E. (2000): "*Telecommunications @ the Millennium: The Telecom Act Turns Four*", FCC.

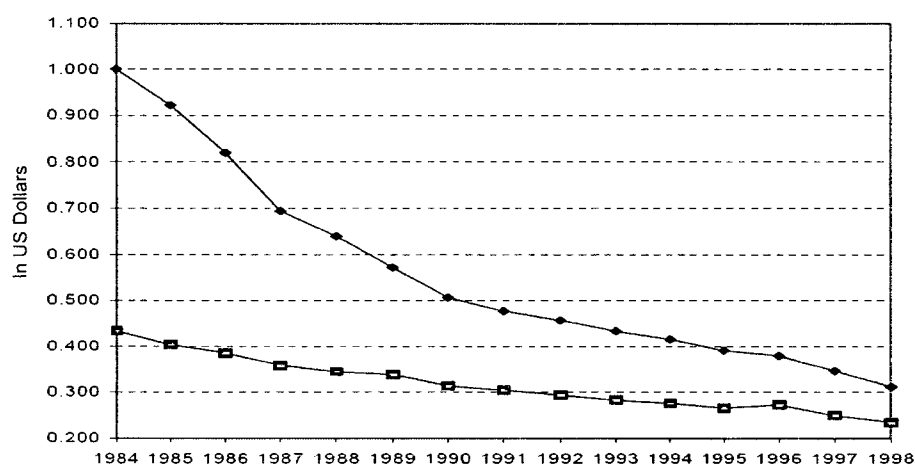
The MFJ prevented the local telephone companies that came out of the Bell System i.e. the RBOCs, from entering the long distance market. This was done to counter the anti-competitive consequences this would have in the long distance market. The anticompetitive effect would arise as the RBOCs controlled the essential inputs for the long-distance services, such as terminating access of phone calls to consumers within a local company's service area where the RBOCs enjoyed monopoly franchises⁸. Success of competition in the long-distance market allowed the US Congress to look balanced in the Telecommunications Act of 1996 by trying to establish competition in the local market by allowing RBOCs into long distance after they met certain conditions.

Telecommunication companies try to be in as many markets as possible. They attempt this so that they can bundle the various products. The telecommunication companies believe that the consumers prefer to pay more for bundled services for which they receive a single bill. Bundling also discourages the consumers from moving to other companies i.e. competitors, who may not offer the bundled services thereby reducing loss of consumers. The telecommunications network closest to the consumer, i.e. the local loop, remained a bottleneck controlled by the Local Exchange Carriers (LECs). In 1996 Ameritech Bell Atlantic, Bell South, SBS and US West (RBOCs) controlled 89 percent of access lines across US. Majority of the remaining lines were controlled by GTE and some independent franchises. Basic local service provided by LECs was not considered profitable⁹. However, apart from providing access to long-distance companies, the LECs also, provided to its consumers, lucrative 'custom local exchange services' (CLASS), such as call waiting, conference calling and automatic number identification.

⁸ A long distance phone call is carried by local telephone companies of the place it originates and terminates. Only the long-distance part is carried by a long-distance company. Thus the local companies offer the 'originating access' and 'terminating access' to long-distance companies, which are essential bottleneck inputs for long-distance service providers.

⁹ Origination and termination of calls is considered extremely lucrative services. In 2001, in most locations across US, access had an average cost of \$ 0.002 per minute with its regulated prices varying. The national average in 2001 was \$ 0.0169 per minute. Such pricing implied a 745 percent rate profit rate.

Figure 1.1: Average Revenue Per Minute (ARPM) of AT&T's Switched Services and ARPM Net of Access Charges^a



Note: (a) The top line shows the ARPM and the bottom line shows the ARPM Net of Access Charges.

Source: Economidies, N (2004): "Telecommunications Regulation: An Introduction", NET Institute, wp #04-20.

The 1996 Act tried to introduce competition in the 'bottleneck' mentioned above. To facilitate entry into local exchange, the 1996 Act introduces two new ways. The first way allowed entry into the retail part of the telecommunications business. It required the Incumbent Local Exchange Carriers (ILECs) to sell, at wholesale prices, any retail service that they offer to entrants. Such entry was limited to the retailing part of the market. The second and most significant novel way of entry was through leasing of unbundled network elements from incumbents. The 1996 Act required that ILECs:

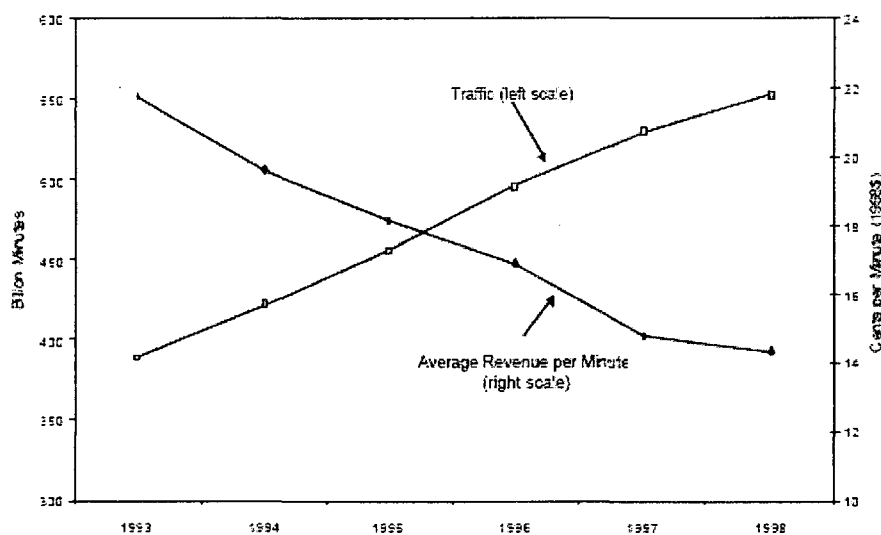
- unbundle their networks, and
- offer for lease to entrants network components i.e. Unbundled Network Elements (UNEs) 'at cost plus reasonable profits'.

Thus the 1996 Act envisioned the telecommunications network as a decentralized network of interconnected networks.

Many firms attempted to enter the market through 'arbitration' agreements with ILECs under the supervision of State Regulatory Commissions and according to the

procedures underlined by the 1996 Act. This was a very long and difficult process with continuous legal obstacles and appeals raised by the ILECs. Till end of June 2001, entrant Competitive Local Exchange Carriers (CLECs) provided 17.3 million (about 9 percent) of the approximately 192 million local telephone lines across US as opposed to 14.9 million (or about 7.7 percent) of nationwide local telephone lines at the end of 2000 in US¹⁰. Majority of these lines i.e. about 55 percent was provided to business customers. Approximately one third of CLEC service provisions were over their own facilities, the percentage of CLEC service (which is total service resale of ILEC services) declined to 23 percent by end of June 2001, while the percentage provisioned over acquired UNE loops grew to 44 percent.

Figure 1.2: Long Distance Prices and Long Distance Traffic (International and Domestic Switched Service)



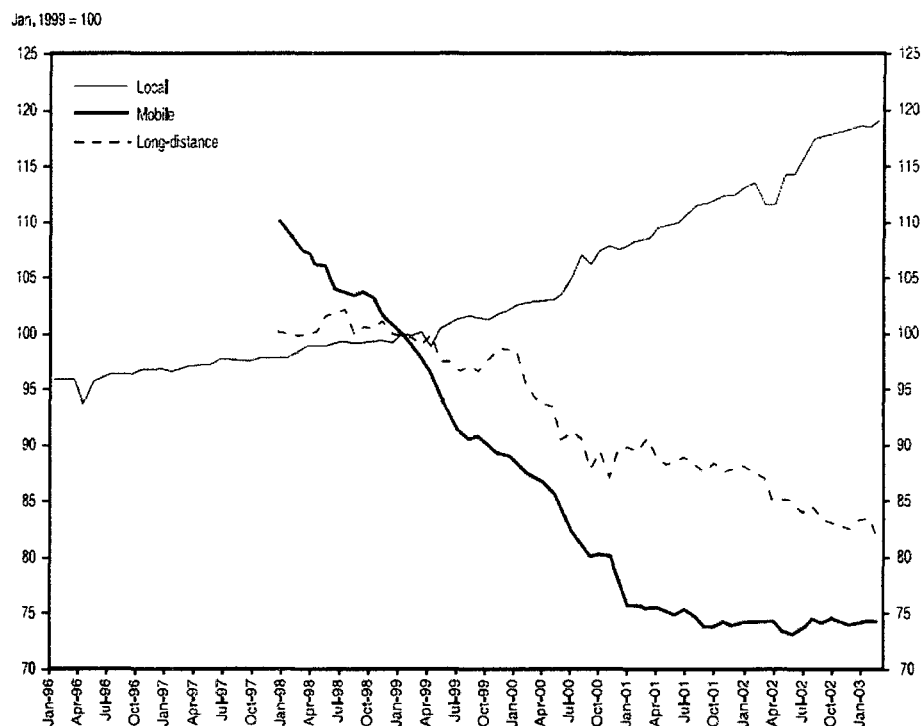
Source: Kennard, W. E. (2000): "Telecommunications @ the Millennium", FCC.

As mentioned earlier, the 1996 Act allowed the entry of RBOCs in long-distance market after a list of conditions were met and the petitioner had convinced that its proposal was in public interest. However, it should be noted that the requirements/conditions can be met only when the local telecommunications service market is sufficiently competitive. Otherwise when an ILEC monopolist enters into long-distance services, it can leverage its monopoly power on its long distance rivals

¹⁰ FCC., (2002a).

and to the latter's disadvantage by increasing its cost in various ways (access charges, controlling the price of a required input like switched access, etc.) as it also competes for long distance customers. This may lead to an ILEC implementing a 'vertical price squeeze'¹¹ on its long distance rivals, where the price-to-cost ratio of long distance rivals is squeezed to drive them out of business. In allowing entry of RBOCs in long-distance, the Act of 1996 tried not to endanger competition in the long-distance markets by premature entry of RBOCs. Table 1.1 summarizes the approved, pending, rejected and withdrawn applications of RBOCs' entry in long-distance markets.

Figure 1.3: Price Indices for Telephone Services



Source: Couper et al (2003): "Boom and Bust in Telecommunications", Federal Reserve Bank of Richmond, *Economic Quarterly*, Vol. 89/4.

¹¹ Vertical price squeeze means differential tariff assuming the nature of anti-competitive conduct that may occur when an operator with significant market power controls certain key inputs required by competitors in downstream markets and where such operators or its affiliates use those key inputs to compete in the downstream market.

Technology Related Changes

The interaction of technological and regulatory changes goes a long way in explaining the behaviour of the US telecommunications industry at the turn of the 21st century. We now discuss some of the major technological changes in the US telecommunications industry¹². Even though the period of telecommunications boom saw significant improvements in technology, the fundamental elements of the infrastructure remained the same. Switchers and routers formed a connection between the originator of the communication and its destination. Copper wire continued to connect most consumers to the nearest local switching centre.

Table 1.1: Status of Long-Distance Applications by RBOCs

State	Filed by	Status	Date Filed	Date Resolved
AZ	Qwest	Approved	9/4/2003	12/3/2003
IL, IN, OH, WI	SBC	Approved	7/17/2003	10/15/2003
Michigan	SBC	Approved	6/19/2003	Due By 9/17/03
MN	Qwest	Approved	2/28/2003	6/26/2003
Michigan	SBC	Withdrawn	1/15/2003	4/16/2003
NM, OR & SD	Qwest	Approved	1/15/2003	4/15/2003
Nevada	SBC	Approved	1/14/2003	4/14/2003
DC, MD, WV	Verizon	Approved	12/18/2002	3/19/2003
CO, ID, IA, MT, NE, ND, UT, WA, & WY	QWEST	Approved	9/30/2002	12/23/2002
California	SBC	Approved	9/20/2002	12/19/2002
FL, TN	BellSouth	Approved	9/20/2002	12/19/2002
Virginia	Verizon	Approved	8/1/2002	10/30/2002
MT, UT, WA, & WY	QWEST	Withdrawn	7/12/2002	9/10/2002
NH, DE	Verizon	Approved	6/27/2002	9/25/2002
AL, KY, MS, NC, SC	BellSouth	Approved	6/20/2002	9/18/2002
CO, ID, IA, NE, & ND	QWEST	Withdrawn	6/13/2002	9/10/2002
New Jersey	Verizon	Approved	3/26/2002	6/24/2002
Maine	Verizon	Approved	3/21/2002	6/19/2002
Georgia/Louisiana	BellSouth	Approved	2/14/2002	5/15/2002
Vermont	Verizon	Approved	1/17/2002	4/17/2002
New Jersey	Verizon	Withdrawn	12/20/2001	3/20/2002
Rhode Island	Verizon	Approved	11/26/2001	2/24/2002

¹² It should, however, be noted that these technological advances were not entirely exogenous in nature. Most of the technological advances pertaining to the telecommunications industry in US came from the research and development of the firms, who took these in expectations of generating future profits.

Georgia/Louisiana	Bellsouth	Withdrawn	10/2/2001	12/20/2001
Arkansas/Missouri	SBC	Approved	8/20/2001	11/16/2001
Pennsylvania	Verizon	Approved	6/21/2001	9/19/2001
Connecticut	Verizon	Approved	4/23/2001	7/20/2001
Missouri	SBC	Withdrawn	4/4/2001	6/7/2001
Massachusetts	Verizon	Approved	1/16/2001	4/16/2001
Kansas/Oklahoma	SBC	Approved	10/26/2000	1/22/2001
Massachusetts	Verizon	Withdrawn	9/22/2000	12/18/2000
Texas	SBC	Approved	4/5/2000	6/30/2000
Texas	SBC	Withdrawn	1/10/2000	4/5/2000
New York	Verizon	Approved	9/29/1999	12/22/1999
Louisiana	BellSouth	Denied	7/9/1998	10/13/1998
Louisiana	BellSouth	Denied	11/6/1997	2/4/1998
South Carolina	BellSouth	Denied	9/30/1997	12/24/1997
Michigan	Ameritech	Denied	5/21/1997	8/19/1997
Oklahoma	SBC	Denied	4/11/1997	6/26/1997
Michigan	Ameritech	Withdrawn	1/2/1997	2/11/1997

Source: Economidies, N (2004): "Telecommunications Regulation: An Introduction", NET Institute, wp #04-20.

For voice communication, an analog signal travels to a local switching centre where the signal is converted to digital format. Fibre cables, also known as trunks, carry the digital signals between switches. The signal is converted back into analog format sufficiently near the destination and directed to its destination in the local loop via the copper line. Analog signaling uses variations in some physical property such as frequency or amplitude to transmit information. Digital signals are composed of discrete 'on' or 'off' units. Fibre has proved to be far superior to copper in its ability to transmit data. Since most of the infrastructure running into homes consists of copper wire, technologies that improve the data transfer ability of copper wires, in particular DSL, were an important part of the development of telecommunications in US.

Technological advances that have increased the data transfer capacity of glass fibres have also been important. These have been one of the most impressive advances in telecommunications in recent years. In 1996 a strand of fibre was capable of transmitting data at approximately 2.5 gigabits per second (Gbps). By 2000 the

capacity of the same fibre could reach 100 Gbps¹³. The increase in capacity of fibre to transfer data came from development in 'multiplexing'¹⁴. Instead of 2.5 Gbps over one wavelength companies could replicate this flow of data over 40 wavelengths on the same fibre. Similar changes took in the wireless communication services. While the first-generation wireless was analog, digital second-generation wireless networks which were introduced in 1993 were able to transmit data much faster¹⁵. This shift to second-generation wireless technology increased the quality and reliability of the wireless network. As a result wireless became feasibly more substitutable for fixed wire voice communications.

Another important technological change that has helped improve the performance of the telecommunications industry has been the shift from circuit switching to packet switching. Earlier the voice calls were circuit switched¹⁶ and much of the capacity used to go unused. Over the past few years the telecommunications providers gradually shifted to packet switching¹⁷ as voice communication moved to digital transmission. As packet switching uses whatever bandwidth is available for

¹³ While the number of transistors per square inch on integrated circuits has doubled roughly every 18 months (Moore's law), fiber's capacity to transmit data doubled approximately every nine months between 1996 and 2000. See Couper et al 2003.

¹⁴ Multiplexing is a mechanism where the transmission of more than one channel of information over a single medium occurs.

¹⁵ Time division multiple access was the first 'second-generation' technology was introduced in 1993. The global system for mobile communication is based on the time division multiple access technology and is common in most parts of the world.

¹⁶ Voice calls being circuit switched means that an entire circuit and therefore all of the bandwidth on that circuit is used for a single call i.e. end-to-end.

¹⁷ In packet switching, the voice signals, which are analog in nature, is converted into digital packets of data and are transmitted separately to their destination on whatever bandwidth is available. There the packets of data are reassembled and converted into sound again. This same process is used for transmission of data over the Internet. It should, however, be noted that voice communication is transmitted and switched mainly in digital form and even when circuit based switching is used. The difference in circuit-based switching and packet based switching lies in manner in which the network allocated bandwidth. However, neither type handles information or data in analog form, except at the local loop level.

transmitting data and because bandwidth is distributed as needed it leads to more efficient use of available capacity.

On the whole, the above mentioned advances in basic technology for providing telecommunications services would have two implications. Firstly, as the capacity of the existing networks would increase dramatically compared to the earlier networks, the prices of the existing services would be expected to fall. This may be due to the fact that the telecommunications service providers may wish to add to the customer base with cheaper and more efficient services. Secondly, the dramatic increase in capacity and speed would lead to the development of newer applications which would benefit from this high speed and high capacity in transmission of data. The World Wide Web or the live video streaming would be some examples of telecommunications services that require these high speed and high capacity data transmission technology. The interaction between advances in basic technology i.e. speed and capacity, and new applications may represent a 'virtuous circle' in which development of new applications leads to demand for bandwidth and leads to advances in technology which supply more bandwidth, which in turn makes new bandwidth-requiring applications feasible. It is widely believed that the acceptance of this interaction was one important reason for the telecommunications boom.

Failure of Competition under the 1996 Act

The Telecommunications Act of 1996 replaced the regulatory framework of the 'natural monopoly' era with a radical deregulatory approach that promised new consumer benefits through competitive forces both, in the local as well as the long-distance market. This competition never arrived, largely due to the fact that the legal imbroglio between the regulators and the antitrust officials and the telephone and cable companies resulted in an improper implementation of the Act of 1996. The Act of 1996 gave FCC considerable discretion in implementing the Act's provisions. The telecom companies used a variety of legal tactics while trying to make favourable, FCC's interpretation of the 1996 Act.

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The incumbent firms challenged FCC's rules concerning:

1. whether FCC had the authority to put into practice the unbundled network element schemes,
2. which network elements should be unbundled, and
3. under what conditions the entrants would have access to those elements.

US Supreme Court's decision in January 1999 in *AT&T vs Iowa Utilities* finally established FCC's jurisdiction. Incumbent firms and State Utilities Commissions fought against the entrant firms and FCC over its choice of total element long-run incremental cost (TELRIC)¹⁸ as the pricing mechanism for the Unbundled Network Elements (UNEs). This pricing scheme is based on the forward-looking cost faced by a hypothetical efficient network, including reasonable profits for the incumbent firms. Unbundling of network elements, like the local loop, facilitated entry of new players into sub-markets, such as local and tandem switching. On the one hand, it helped the competitors to gradually move in the direction of the user and on the other, it made possible for them to enter local competition without the heavy investment. It provided more flexibility for the entrants in providing local service. The incumbent firms believed that this pricing methodology would not allow them to recover the costs of their network and thus challenged FCC's pricing order in court. The US Supreme Court rejected the arguments of the incumbent firms in May 2002.

FCC's Collocation Order¹⁹ allowed the entering firms to put into place, in incumbent firm's central office, necessary equipment and devise a cost-recovery methodology for collocation. This made the incumbents feel that the new entrants were being given too much access and they challenged the order. In March 2000, the Washington D.C. Circuit Court of Appeals, in *GTE vs FCC*, while agreeing with the incumbents that the decisions of necessary and physical collocation were too broad, approved other

¹⁸For details see Jorde et al (2000): "*Innovation, Investment and Unbundling*", Yale Journal on Regulation, Vol. 17, No. 1.

¹⁹ For details see FCC, Docket No. 94-999-01 (Phase IIIA) Order on Collocation, Issued January 21, 2000.

features of the Collocation Order, including FCC's cost recovery methodology and the broad definition of premises to which the entrant firms had access. While upholding FCC's requirement that incumbent carriers offer CLECs space outside of central offices once space there is depleted and FCC's collocation-pricing rules, the court struck down other parts of the Order as beyond the commission's authority. They included a requirement that ILECs make available space for CLEC equipment that is merely "used or useful" for interconnection, rather than that which is "necessary", as specified in the Telecommunications Act of 1996²⁰. This meant that the incumbent was not forced to allow use of its capital resources by the entrants, but only for those interconnections that the entrant could show as necessary.

The 1996 Act gave FCC the authority to set 'pole attachment rates'²¹ for all telecommunications providers. FCC had set rates for cable and telephone companies since 1978. In 1998 FCC added cable Internet and wireless attachments to the list of regulated attachments. This was also challenged in court by power companies who argued that cable Internet and information services were not a part of telecommunications services and so FCC had no jurisdiction. The US Supreme Court, however, agreed with FCC and the rules were upheld.

While passing the 1996 Act it was assumed that deregulation would spur competition, even in markets where competition never existed or where competition was just unfolding. In doing so the policy makers relaxed ownership limitations prematurely while the regulators allowed mergers and acquisitions based on theoretical and potential competition that never materialized. It has been rightly said,

²⁰ *"FCC Gets Split Decision On Collocation"*, Communications Today, March 21, 2000.

²¹ The Pole Attachment Act gave FCC the authority to regulate the rates, terms and conditions for attachments by a cable television system or provider of a telecommunications services a pole, duct, conduit, or right-of-way owned or controlled by a utility. The Pole Attachment Act gave FCC the general authority to regulate such rates, terms and conditions provided the same were just and reasonable. For details see FCC DA 01-2712, November 21, 2001.

“Instead of the predicted nirvana of a free and open market with numerous options for consumers and flourishing technology, there was concentration and little choice”²².

Almost all consumers had at most two choices for a full package of telecommunications services: the local telephone company or the cable company. Even after more than a decade, the cable and telephone industries remained highly concentrated. Even after 10 years of the passing of the Act, cable operators still had 72 percent market share of the multichannel video market. Telephone companies had an 85 percent share of local telephone subscribers, 75 percent of long distance and more than 50 percent of wireless customers. High speed internet was more evenly distributed between the local cable companies and telephone companies, with cable companies controlling about 60 percent of the market. However, if one considers the advanced services, the share of cable went upto 80 percent²³.

The duopolies which were created did not bring benefits to the large segments of consumers either on price or on innovation. In video, competition and anticompetitive bundling of programming led to cable rates increasing almost 3 times faster than inflation rate. Since the 1984 breakup of AT&T, long distance prices of low-volume phone users have been on the rise. The enormous price reductions for all phone revenues came to an end as long-term contracts, early termination fees and stagnating prices for low-volume options persisted.

Each cable or telecommunications giant protected its own base of services while staying out of others' service territory. In addition, they bundled services (e.g., cable with broadband) in order to keep potential competitors, such as satellite service

²² Kimmelman et al (2006): “*The Failure of Competition Under the 1996 Telecommunications Act*”, Federal Communications Law Journal, Vol. 58, No. 3.

²³ *Ibid*

providers, at bay. This has resulted in a lack of service options for consumers. Instead of paying and getting the exact services they want, they must instead purchase packaged services— Digital Subscriber Line (“DSL”) tied to local phone service, or cable modem service tied to a cable video package. Getting the benefits of a discounted bundle causes the average household to expend much more for a cluster of services, some of which they may or may not use.

Even though the Act of 1996 aimed at bringing competition in the local telephone services, the methods used in implementing were often ambiguous and difficult to interpret. The 1996 Act gave FCC considerable discretion in formulating rules and implementing the Act’s provisions. The telecommunication firms challenged many of FCC’s methods and its interpretation of the Act of 1996. If FCC’s choices favoured the entrants, it was challenged by the incumbent firms and vice-versa, and along with counterchallenges being filed in US Courts the implementation of the Act became complicated.

The Industry’s Response

Technological improvements in providing telecommunications services advanced at a rapid pace in the late 1990s in US. This laid the ground for both lower prices for the then existing services and for the introduction of a variety of new services. This was further supplemented by the fact that regulatory environment appeared to be transforming and trying to introduce competition in the local telecommunications markets. As mentioned earlier the telecommunications boom was based on the propitious interaction between technology and regulatory changes. With improvements in technology, changes in regulatory environment favouring competition in local market and new products made feasible due to the technological advances, it is not surprising that the telecommunications sector of US showed significant volatility during 1996-2003.

It was expected that the 1996 Act would usher in competition and encourage innovation, especially in the local market, as had been seen in the long distance telecommunications in US after the break-up of AT&T in 1984. Even though the uncertainty over the implementation of the Act of 1996 did act as a dampener on the optimism, it was anticipated that these issues will be resolved quickly. It can be safely argued that the regulatory uncertainty was a secondary factor in fuelling the investment in the US telecommunications industry doing little to discourage investment in the industry as a whole. However, it may have directed the flow of investments in US telecommunications. It should be, however, noted that the uncertainty over the implementation of the 1996 Act was a cause of concern for the new entrants in the short-run. But early FCC rulings and different US Courts' decisions brought an optimistic assessment for the new entrant firms' prospects. The US Supreme Court's 1999 decision about FCC's authority over pricing mechanism (TELRIC) was hailed as great news for the Competitive Local Exchange Carriers (CLECs) and was perceived as a ruling that would create certainty in the US telecommunications industry.

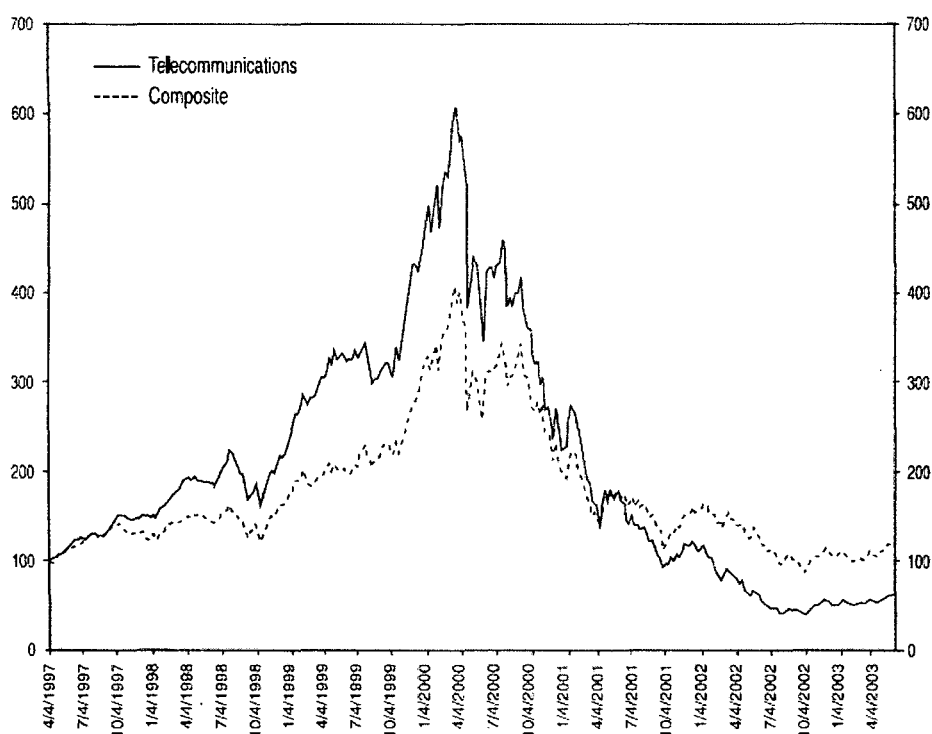
After the Telecommunications Act of 1996 was passed, CLECs experienced a tremendous boom. From 1996 to 2000 the number of CLECs increased from 30 to 711 and their revenue increased from about \$ 3 billion to about \$ 86 billion. However, over the same period S&P 500 telecommunications services companies²⁴ grew in market capitalization by about \$ 500 billion. Clearly, even though the growth rate on entrants was high (about 96 percent over the period 1996 to 2000), the increase in their market capitalization did not account for a large part of the telecommunications boom²⁵.

²⁴ S&P 500 Companies denotes the list of companies, maintained by Standard & Poor, comprising of 500 large-cap American companies which cover around 75 percent of the American equity market by capitalization.

²⁵ Couper et al (2003) and Lenard (2002).

The confluence of change in regulatory regime and rapidly advancing technology led to a tremendous investment surge and high stock valuations in the US telecommunications industry. The NASDAQ index of telecommunications stocks rose from 198 in April 1997 to 1,230 in March 2000, i.e. an average annual increase of about 84 percent. On March 16, 2003, the index stood at 136 i.e. an average annual decrease of about 50 percent since March 2000²⁶. Over the same periods the NASDAQ Composite Index rose annually by 61 percent and fell annually by 32 percent for the respective periods. Figure 1.4 shows the time series of the NASDAQ telecommunications index and the NASDAQ composite index over the period mentioned above. The equity variations show the telecommunications boom and bust very clearly.

Figure 1.4: NASDAQ Telecommunications and Composite Indices^b

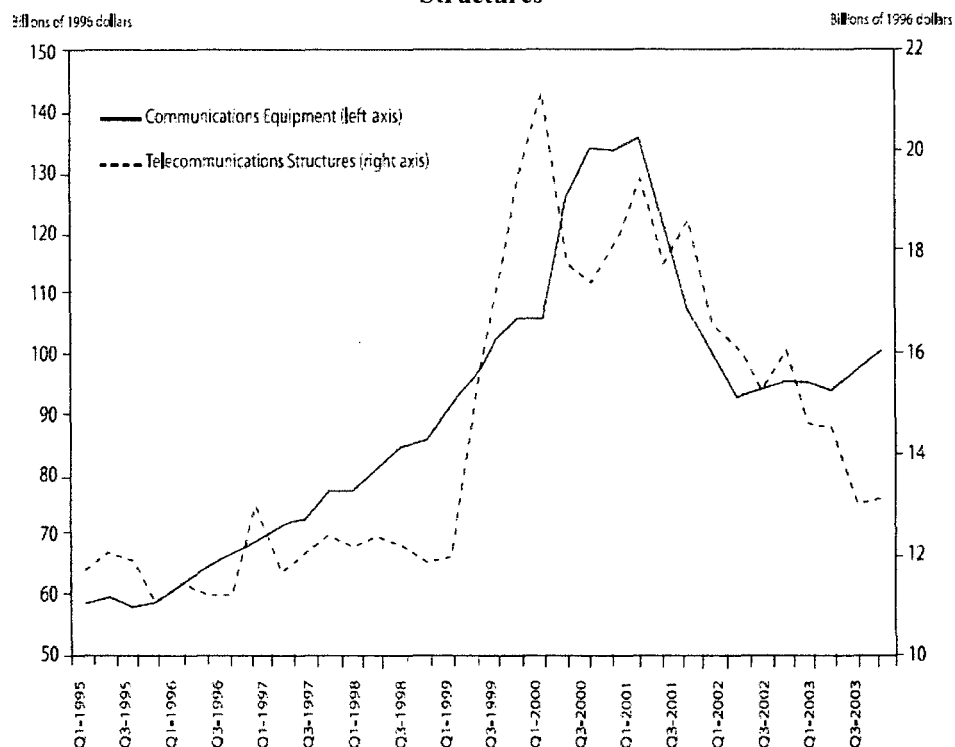


Note: (b) End of week close. Both series are normalized so that April 4, 1997 = 100.

Source: Couper et al (2003): "Boom and Bust in Telecommunications", Federal Reserve Bank of Richmond, *Economic Quarterly*, Vol. 89/4.

²⁶ Couper et al (2003).

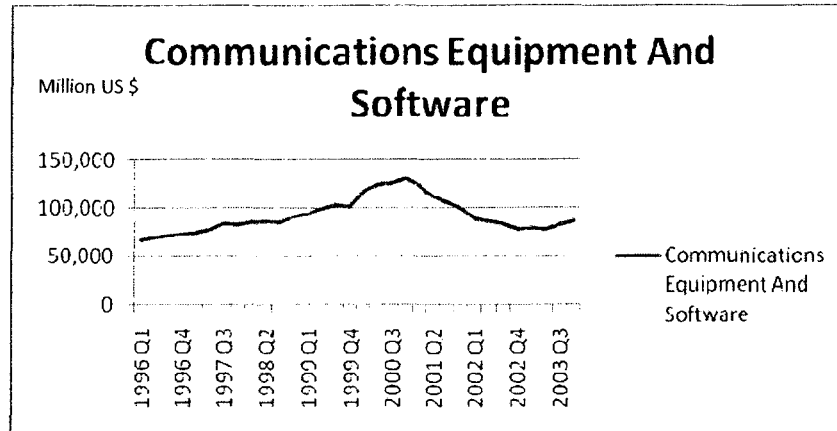
Figure 1.5: Real Private Fixed Investment in Communications Equipment and Structures



Source: Couper et al (2003): "Boom and Bust in Telecommunications", Federal Reserve Bank of Richmond, *Economic Quarterly*, Vol. 89/4.

During the first quarter of 1996 and fourth quarter of 2000, investment in communications equipment in US grew from approximately \$ 62 billion per year to over \$ 135 billion per year in constant 1996 dollars i.e. an average annual growth of approximately 18 percent. This is shown in Figure 1.5. Communications investment growth was negative for seven straight quarters since the fourth quarter of 2000. In the fourth quarter of 2001, the investment level was below \$ 93 billion, i.e. only 69 percent of the same figure in 2000. As a percentage of private investment, communications equipment fell from approximately 7 percent in 2000 to 4.8 percent by 2002 end. Huge growth occurred in the fourth quarter of 1999 when the investments in structures rose by \$ 9 billion in that year to reach levels greater than \$ 21 billion. The same had fallen since then to about \$ 13 billion at the end of 2002. Real investment in telecommunications structures, in US was, more or less constant through the 1990s at about \$ 12 billion.

Figure 1.6: Private Fixed Investment in Communications Equipment and Software, US



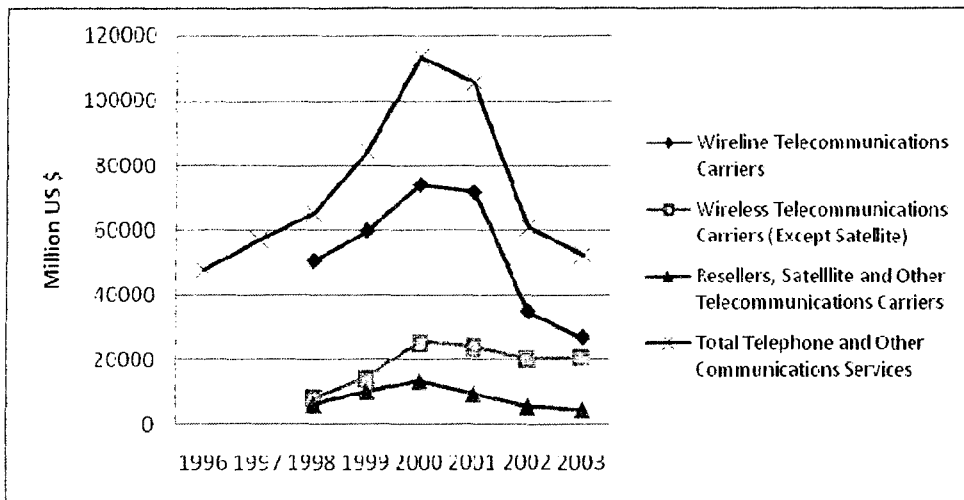
Source: Bureau of Economic Analysis, US.

Figure 1.6 shows plot of the private fixed investment in communications equipment and software for first quarter of 1996 through the fourth quarter of 2003. The investments rose from 1996 till 2000, reaching a high of \$ 129,817 million in the fourth quarter of 2000. From the first quarter of 2001 there has been a decline and by the first quarter of 2003, it had reached levels of investment seen in 1997. Though there has been a reverse in trend since 2003, but even till now it has not equalled the levels achieved in its peak. Capital expenditure in equipments and structures undertaken by telecommunication carriers is shown in Figure 1.7. The expenditures increased dramatically from 1996 to 2000 and declined since. While the decline in wireless and resellers has been less pronounced, the decline in the wireline telecommunication carriers has been more pronounced.

Table 1.2 shows the capital expenditures for structures and equipments by carriers per dollar of end-user telecommunication revenues. In other words it shows that for each dollar of revenue collected from end-users how many the carriers invested in structures and equipments. For example in 2005, wireless carriers invested 27 cents in structures and equipment whereas wireline, resellers, satellite & other carriers invested 20 cents. The per dollar investment of wireline, resellers, satellite & other carriers increased between 1998 and 2000, reaching to 51 cents invested for per dollar

of revenue collected from end users. Since 2001, there has been a decline, reaching the lowest in 2003 (17 cents invested for per dollar of revenue collected).

Figure 1.7: Capital Expenditure in Structures and Equipment, US



Source: FCC, Trends in Telephone Services, 2008.

Table 1.2: Capital Expenditure for Structures and Equipment by Carriers Per Dollar of End-User Telecommunications Revenues (in US \$)

	Wireless Carriers	Wireline, Resellers, Satellite & Other
1998	0.25	0.35
1999	0.32	0.41
2000	0.44	0.51
2001	0.35	0.49
2002	0.27	0.26
2003	0.25	0.18
2004	0.25	0.17
2005	0.27	0.20
2006	0.25	0.25

Source: FCC, Trends in Telephone Services, 2008.

The above analysis clearly illustrates the fact that while the investment increased dramatically, by both wireline and wireless carriers, till 2000-01, there was a secular decline since, with almost all the carriers cutting down on investments.

During the period from 1996 to 2000, investment was channelled primarily into long-haul fibre optic networks. Regulatory barriers were few in such an investment for building such networks and the value of these networks was expected to increase, primarily due to two main reasons. Firstly, eventual opening of local exchanges to competition would allow the owners of such network capacity to compete to be a single provider especially if it was able to attract a large customer base, as it would be able to achieve increasing returns to scale. Secondly, due to the rapidly increasing use of Internet the demand for bandwidth was increasing. Traffic on Internet backbones in US was estimated to have grown from 16.3 terabits²⁷ per month to 1,500 terabits per month²⁸. Rapid growth in the demand for bandwidth was widely forecasted and as a part of the virtuous circle new applications being developed to take advantage of the bandwidth.

The promise of future access to local exchanges brought about by the change in regulatory environment along with expected increases in demand for bandwidth from the Internet, the construction of long-haul fibre networks exploded after 1996 in US. Table 1.3 shows the advanced services line in US. Between 2000 and 2001 advanced services line grew by more than 114 percent. Much of the investment was undertaken by the new firms such as Quest, Level 3, etc. ATA&T, MCI, WorldCom and Sprint together accounted for about 72 percent of long-haul fibre in US. However, by 1999 they accounted for only 30 percent of the total, even though during the same period annual fibre deployment increased by more than four-fold in US. Lucent Technologies was one of the major producers of fibre and was expanding its facilities to increase fibre output by 60 percent. Table 1.4 shows the data on fibre miles, which are calculated by multiplying the number of miles of fibre cable by the number of fibre strands per cable. Even though the ILECs added more fibre miles than the competitors, Table 1.4 shows that the latter had a faster rate of growth.

²⁷ One terabit is one trillion bits.

²⁸ Odlyzko (2002).

It was widely predicted that the Internet use will double every three to four months in US. This was considered to be one of the ‘mantras’ of the US telecommunications boom. Many analysts have attributed the origins of such kind of predictions to WorldCom (now called MCI). WorldCom dominated internet backbone services and was subject to regulatory oversight. It is reasonable to think that the misrepresentation of growth of internet traffic by WorldCom was believed by rival firms²⁹. However, it would be difficult to establish the real effects of such claims. Throughout the boom period major players outside WorldCom continued to assert that Internet traffic was doubling every 100 days. William E. Kennard, the Chairman of FCC, in a report had this to say, “Electronic commerce has grown from next to nothing in the early 1990’s to around \$70 billion in 1999, and is projected to exceed \$1 trillion in the next few years. This growth is one of the drivers causing data traffic to double every 100 days”³⁰.

Table 1.3: Advanced Services Lines (Over 200 Kbps in Both Directions)

	Total Lines	Percentage Change
1999	1,988,455	
2000	2,598,816	30.70
2001	5,571,605	114.39
2002	10,029,042	80.00
2003	15,863,169	58.17
2004	22,966,048	44.78

Source: FCC, Trends in Telephone Services, 2002 and 2008.

Contradictory forecasts were also being made during the telecommunications boom in US. Odlyzko has pointed out that Internet growth rates of 100 percent in every three months would have implied that between 1994 and 2000 Internet usage would have grown by a factor of 17 million³¹. Such a growth did occur for a time in 1995 and 1996 when Internet first came into prominence as a major new factor which could

²⁹ Sidak (2003).

³⁰ Kennard, W. E. (2000): “Telecommunications @ the Millennium: The Telecom Act Turns Four”, FCC.

³¹ Odlyzko (2002).

derive future growth. By the end of 2000, the myth of Internet growth doubling every three to four months in US was very hard to accept.

Table 1.4: Fibre Miles

	1996 ^c		1997		1998	
	ILECs	CLECs	ILECs	CLECs	ILECs	CLECs
Fibre Miles (Millions of Fibre Miles)	12.3	1.3	14.0	1.8	16.1	3.1
Percentage Change in Fibre Mileage	15	104	14	39	15	72

Note: (c) Percentage for 1996 is over the 1995 data.

Source: Trends in Telephone Service, FCC, March 2000.

If we suppose that such growth rates were sustained throughout the period of 1996 to the end of 2000, it would produce highly absurd traffic volumes. Traffic on the NSFNet³² backbone at the end of 1994 came to about 15 terabyte³³ per month. If the traffic had grown at 1,500 percent per year (which is what doubling every three months corresponds to), there would have been about 250,000,000 terabyte per month of backbone traffic in US by end of 2000. If we assume 150 million Internet users in US, that would produce a data flow of 5 megabytes per second for each user around the clock. Forecasts based on these growth rates and the 1994 Internet usage data would mean that every Internet user in US in the year 2000 would have been constantly downloading streaming video.³⁴ Table 1.5 clearly shows that the forecast of traffic on the Internet backbones in US was, in reality, a myth. Even by the most optimistic estimates of 2002 i.e. 140,000 terabytes per month, it did not reach the

³² NSFNet is a loosely organized community of networks in US, funded by the National Science Foundation to support the sharing of national scientific computing resources, data and information. For details see, Mills, D. L. and Braun H. W: "The NSFNET Backbone network", *Proc. ACM SIGCOMM 87 Symposium* (Stoweflake VT, August 1987), 191-196.

³³ A terabyte is 1000000000000 bytes.

³⁴ Coffman and Odlyzko (2001).

level required to achieve a growth that was forecasted. It was estimated that data sent over the Internet has approximately doubled every year since 1997 in US³⁵.

Table 1.5: Traffic on Internet backbones in US

Year	Terabytes per Month
1994	16.3
1995	--
1996	1,500
1997	2,500-4000
1998	5,000-8,000
1999	10,000-16,000
2000	20,000-35,000
2001	40,000-70,000
2002	80,000-140,000

Source: Odlyzko, A (2002): “*Measurements and Mismeasurements and the Dynamics of Internet Data Traffic Growth*” Computer Measurement Group’s 2002 International Conference, December, 11, Reno, Nev.

If we consider the fact that the kind of applications that would come into use was virtually unknown, even in US, it’s not difficult to assess this forecasted growth rate on Internet in US as excessively optimistic. In the backdrop of dramatic changes in technology and market conditions that were suppose to usher in competition, it is not surprising that there was heterogeneity in forecasts in US. However, in the period of the telecommunications boom in US, market decisions and outcomes reflected the optimists more than the pessimists.

Even with the passage of the Telecommunications Act of 1996, it was not perceived that the competition in the local market would arrive overnight. However, by late

³⁵*Ibid.*

2000 i.e. after four years of the passing of the 1996 Act meaningful competition had not arrived in the US telecommunications market. Furthermore, the implementation of the 1996 Act was caught up in courts with challenges and counter-challenges being filed both, by the incumbent firms and the new entrants over the rulings of FCC. In addition the US economy was weakening and it was becoming clear that there was significant overcapacity in long-haul fibre optic market. Combined together these factors spelled the gloom for the US telecommunications sector.

As mentioned earlier the number of LECs grew dramatically from 1996 to 2000. Even then their share in local telephone market was less than 8 percent in 2000. Moreover, only about 40 percent of that share consisted of competitors using their own lines for facilities based competition than by reselling ILEC service or by purchasing some unbundled elements from incumbents³⁶. But the entrants' reliance on the incumbents' entire network was thrown into question a few weeks later when an appellate court reversed the FCC's decisions regarding the scope of the whole unbundling requirement. In July 2000, the Eighth Circuit Court of Appeals in *Iowa Utilities Board vs FCC* gave an adverse ruling on FCC's pricing methodology (TELRIC), thereby exposing the entrant firms who followed the above mentioned strategy. The market capitalization of CLECs fell 63 percent i.e. \$ from 86.4 billion in 1999 to \$ 32.1 billion in February 2001, and then 88 percent i.e. to just \$ 3.77 billion in February 2002³⁷. On the other hand, the market values of major ILECs fell less than that of CLECs during this period suggesting that the market power of ILECs increased after the Eighth Court's Decision. Also the mergers that took place in the ILECs helped them in improving their market shares.

The deregulation in the telecommunications industry in US paved the ground for companies to develop technical competence and to develop competition strategies. Telecommunication companies, that were viewed as distinct in the products and

³⁶ Crandall (2002).

³⁷ Couper et al (2003).

services they offered, established partnerships that changed the telecommunications industry's fundamental basis of competition. Post-deregulation years produced record-breaking US telecommunications mergers and acquisitions and the rules of competition were completely reversed. The 1996 Act left an opportunity for those companies that were looking to merge in order to gain even more market share. It paved the way for merger of SBC with AT&T and Verizon with MCI. These two mergers reflect the abandonment of competition as envisioned by the 1996 Act. AT&T and MCI were the two largest non-Bell companies in the local market. They were also the largest long distance companies, with over half of the market nationwide.

With little or no competition occurring in the local market, as envisioned by the 1996 Act, major long-distance companies bought companies that gave them some access to the local market. These companies believed that there was only one sure way to enter the new markets (local markets), buy their way in. In 1998, MCI and Brooks Fibre Properties were bought by WorldCom for \$ 40 billion for \$ 1.2 billion respectively. Prior to this acquisition, WorldCom had UUNet and MFS Communications for \$ 12 billion. MCI-WorldCom focussed primarily on the Internet and the long-distance market. In 2000, the proposed merger of WorldCom \$ 115 billion with Sprint was blocked by the US DoJ and the Competition Committee of European Union, who feared about the potential dominance of the merged company in the global telecommunications market.

In a bid to reach consumers' homes using cable TV wires for the 'last mile' AT&T bought TCI \$ 48 billion in 1999, as TCI owned a local exchange infrastructure that reached business customers. This created a new giant with 70 million long-distance customers, 15 million business clients, 20 million cable subscribers, four million wireless customers, 1 million dial-up Internet clients, 159,000 employees, and \$59 billion in annual revenues³⁸. AT&T planned to convert the TCI cable access to an

³⁸ Warf (2003).

interactive broadband, voice and data telephone link to the residences. It also entered into an agreement with Time Warner to use its cable connection in a way similar to that of TCI. In 1999, AT&T outbid Comcast and acquired MediaOne for \$ 62.5 billion. The pressure from financial markets forced AT&T to go for a voluntary breakup into a wireless unit, a cable TV unit and a long-distance and a local service company, which retained the name AT&T and the symbol 'T' at the New York Stock Exchange. In 2002, AT&T sold AT&T Broadband to Comcast for \$ 47.5 billion.

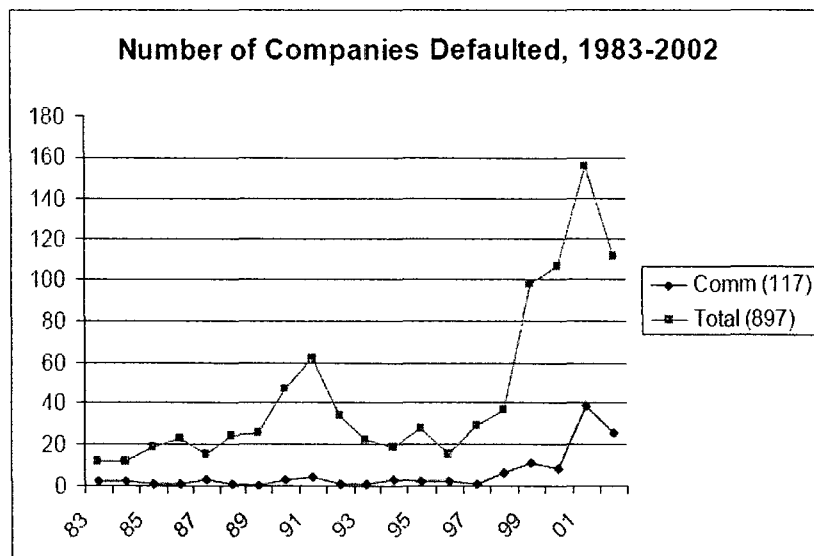
MCI purchased Sprint for \$ 108 billion in 1999, creating a union of the second and the third largest telecommunications carriers in US with 30 percent share in the long-distance market. Despite antitrust objections Pacific Bell was acquired by SBC and NYNEX by Bell Atlantic, in an attempt by RBOCs to strengthen their foothold in the long-distance market. Bell Atlantic merged with GTE to form Verizon, SBC bought Ameritech and US West merged with Quest (a new long-distance service provider). Thus, the eight large LECs of 1984 were reduced to only four i.e. Verizon, Bell South, SBC and Quest. AOL's purchase of Time Warner for \$ 165 billion in 2000 created the world's largest media company with 78 million Internet clients, 19 percent of the U.S. cable television market (including television HBO, CNN, and Turner Broadcasting), 13 percent of movie box office sales (including Warner Brothers), 16 percent of music sales (\$ 771 million annually) and 21 percent of magazine subscriptions and advertising subscriptions or \$ 2.7 billion annually³⁹.

The crisis at the end of the century in the US telecommunications sector arose primarily out of the incorrect forecasts of the speed of the expansion of Internet. At the time when the predictions were made Internet was growing at 400 percent. However, the growth rate slowed with respect to the number of new hosts connected. Also, as no new 'killer applications' requiring a lot of bandwidth was unveiled, the growth rate in bits transferred also slowed. On the basis of the optimistic projections of Internet growth tremendous investment in Internet transport and routing capacity

³⁹ *Ibid.*

took place. In addition, the capital markets were very liberal and consequently many companies invested and deployed telecommunications equipment much more than that was practical given their then market shares. When the growth predictions were revised downwards, there was an immediate and significant reduction in orders and investments in optical fibre, switching and router equipments. At the turn of the century there was overcapacity of the Internet in US. Since the Internet backbone can be run easily as a long-distance network, the huge overcapacity of the Internet backbone combined with new investments and presence of traditional overcapacity in long-distance network lead to pressure and reductions in long distance prices.

Figure 1.8: Historical Default in US



Source: Harmantzis, F. C (2003): *“Inside the Telecom Crash: Bankruptcies, Fallacies and Scandals”*.

The US telecommunications industry that had consistently outpaced economic growth crashed at the beginning of the new century. The overcapacity in the telecommunications sector was, perhaps, the worst in the US economy. The telecom bubble began deflating in 2000 and by 2001 the industry was straining under excess capacity and enormous debt. Telecommunication executives realized that they would not be able to attain revenue growths of 20 percent or more. A number of debt laden telecommunications companies defaulted or went bankrupt and filed for court protection from their creditors. Figure 1.8 shows the history of default in US. It is

evident that post 1999, the share of telecommunications companies defaulting out of the total defaulting companies increased and peaked around 2002. 2002 was a record year in pre-petition liabilities of bankrupt firms. Considering the cases with liabilities greater than \$ 100 million, there were 112 filings out of which 31 were from the communications sector⁴⁰.

The Telecommunications Act of 1996 was effective in breaking down the regulatory boundaries of the telecommunications industry in US. It opened the existing telecommunications market segment to all entrants. However, from one segment of the industry that began to compete and the other segments, the existing companies (ILECs) were more prevalent than the new entrants (CLECs). Hundreds of new entrants came into the market, changing the competitive structure. However, most of them left the market almost as quickly as they arrived. In addition, the accounting fraud (especially by WorldCom), the highly optimistic projection of internet growth and the money that the dot-com bubble brought led to a massive investment spree in building infrastructure. When the demands failed to realize the stocks plummeted and the 'telecom bubble' burst. This led to defaults at a massive level and further the companies went for consolidation leading to an oligopolistic market structure. Instead of having a competitive environment, as envisioned by the Act of 1996, one saw an oligopolistic competitive market.

⁴⁰ Harmantzis (2003).

Chapter 3

Reforms in the Indian Telecommunications Industry

Until 1985 the Indian telecommunications sector was a Post, Telephone and Telegraph (PTT) model. The Ministry of Posts and Telegraphs and its departments controlled the telecommunications services and the infrastructure. The telegraph lines existed till the 1950s, but gradually telegraph was abandoned and telegrams were transmitted by telephones and tele-printers. During those times the postal service was much more widely used than telephones. As telephone services were more profitable than the popular postal services, the Ministry of Posts and Telegraphs and its departments often used to use the profits from telephone services to cross-subsidize postal services.

Commencement of the Reform Process

Contrary to popular notion, the reform process in the Indian telecommunications industry did not begin with the announcement of new economic policy in 1991, but the reforms were initiated in the 1980s. However, before looking at the reform process in the Indian telecommunications industry, let us first look at the organizational structure of the government telephone utility. It is a part of Government of India, headed by a minister and is in charge of the telephone services. The management of the telecommunications utility consists of differentiated cadres, with each specialist grade being recruited with different minimum qualifications and separate posts allocated to them. The government telecommunication organization was designed to not only protect and promote the interest of its employees but also the preservation of its monopoly⁴¹.

⁴¹ For details see Desai (2006).

The government telecommunications utility's aversion to introduction of competition from the 1950s till the 1980s had three main elements. First, one of the duties of the government was to serve the poor, which implied installing telephones in every village. This objective used to lend sanctity to the government institution as long as there were still villages left in which telephones still needed to be installed and so they went about installing telephones in rural areas but as slowly as possible. This objective till date is one of the primary objectives of the government telephone utilities. Second, the government telephone utility must serve the national objective of replacing import, which was the dominant ideology in those times. Finally, there was this belief that private businesses were unreliable and exploited the poor, so they had to be prevented from entering into procurement and import-replacing activities. For ensuring that the telephone equipments came from faultless sources the Ministry of Post and Telegraph had set up three subsidiaries: Indian Telephone Industries (ITI) to make telephone equipment, Hindustan Teleprinters Limited (HTL), and Telecommunication Consultant India Limited (TCIL) – a consultancy. These were the known as the State Owned Enterprises (SOEs).

Table 2.1: Telephone Addition and Waiting List, 1982-1992

Year Ending 31 st March	DELS ^a (million)	Waiting List (million)	Growth of DELs (%/yr)	Waiting List (months) ^b
1982	2.30	0.59	7.0	47.2
1983	2.47	0.66	7.4	46.6
1984	2.67	0.74	8.1	44.4
1985	2.90	0.84	8.6	43.8
1986	3.17	1.03	9.3	45.8
1987	3.49	1.12	10.1	42.0
1988	3.80	1.29	8.9	49.9
1989	4.17	1.42	9.7	46.1
1990	4.59	1.71	10.1	48.9
1991	5.07	1.96	10.5	49.0
1992	5.81	2.29	14.6	37.1

Note: (a) Dialed Exchange Lines, equivalent to telephones.

(b) Waiting list at the end of the year, divided by average monthly additions to DELs in that year.

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

India had adopted an Industrial Policy Resolution post independence which committed the country to state-led development and state controlled monopolies in several sectors, including telecom. The state monopoly in telecommunications was interpreted to include research and development and also equipment manufacture as has been mentioned earlier. The long term consequence of this state monopoly was not beneficial to the telecommunications utility's consumers. The government telephone utilities had long waiting list and was never able to install enough telephones, as evident from Table 2.1. The official explanation of this waiting list was that within the constraints of domestic equipment making capacity, foreign exchange and the government budget, it was impossible to produce or buy enough equipment to meet the demand. Investment in the telecommunications utility came under the Five-Year plans which gave low priority to telecommunications and classified telecommunication utilities as a luxury. It was widely accepted in government circles that the *aam aadmi* had no need for telephones and other telecom related services (considered to be elitist) and therefore investment in telecommunications should be restricted to serve governments and a few other essential needs. The telephone system began to expand rapidly only in the late 1980s when the ITI-Alcatel factory started delivering switches in large enough volumes.

In 1984 Centre for Development of Telematics (C-DOT) was set up as an R&D organization to develop electronic switches. When C-DOT was set up to design, develop and to produce digital telephone exchanges outside the control of the government, every attempt was made to ridicule its indigenously developed switches. However, over the next five years, C-DOT developed switches which were cheap and did not require air-conditioning. Rural Automatic Exchanges (RAX), with a capacity of 200 lines was developed for use in villages. Larger switches with 40,000 lines were developed for the small towns. Furthermore, the designs were not only licensed to large number of domestic producers but were also exported, mainly to other developing countries⁴². By 2008, switches of C-DOT design have accounted for more

⁴² Centre for Development of Telematics, Annual Report, 2004-05.

than 30,000 C-DOT exchanges totalling approximately to 25 million telephone lines, 63.47% of total switching capacity⁴³.

Britain had separated its telecommunications from posts in 1981. Following the precedent, Rajiv Gandhi government, which came to power in 1984, separated the telephone department and created a new ministry of telecommunications, Department of Telecommunications (DoT) on 1st April 1986. The policy of buying equipment only from SOEs was abandoned by DoT who began to buy it from domestic private enterprises. DoT was also made to give telephones to manned Public Call Offices (PCOs), which were run by small entrepreneurs. By March 2008, 6.2 million PCOs, illustrated with the acronym PCO/STD/ISD, were scattered all over India⁴⁴.

The telecommunications' cross-subsidy to the postal service ended with the formation of DoT. The government also wanted to separate telephone business and make it a government owned business, as done in Britain, which would have given operational freedom to it. But this was opposed by the bureaucracy in the communications ministry as it would alter the power structure in the communications ministry. The government was first told to corporatize two businesses, telephone in the metros and international traffic, as an experiment. Consequent of this, in 1986 two businesses were separated from the ministry. Mahanagar Telephone Nigam Limited (MTNL) was set to manage telecommunications in Delhi and Bombay (now Mumbai) and Videsh Sanchar Nigam Limited (VSNL) to run international telecommunication services.

However, despite this most of the telecommunications utilities remained with the ministry and the services were run by DoT. The board members of MTNL were the bureaucrats of the communications ministry and it inherited the DoT staff in both the

⁴³ www.cdote.com/about_us/success_stories.htm

⁴⁴ TRAI, Annual Report, 2007-08.

metros. Thus, eventually MTNL was under the control of DoT, which used the former to borrow money from the financial markets and pass on the bulk of that amount to DoT for investment. Three-quarters of MTNL's borrowings were siphoned off by DoT. VSNL got some more autonomy in its functioning. However, the interconnection charges fixed by DoT were such that most of the surpluses of VSNL was hived off by DoT. The government telecommunications business was headed by a Telecom Board. Since the Board was an internal committee of the telecommunications department, it was ineffective in dealing with interministerial problems. It was replaced by Telecom Commission in 1989 which had a varied composition covering various ministries as well as the Planning Commission. However, with the change of government in 1989, all these changes were undone and the Telecom Commission again went under the control of DoT with similar way of functioning as the old Telecom Board. The attempt to restructure the telecommunications department resulted in reduction of cross-subsidies and went on to ensure that the profits were used closer to where they were made. There was modest improvement in growth rate of telephone connections, however, not enough to make much difference to the waiting list. The waiting list in 1990 was still four times the year's installed DELs (Table 2.1).

The Indian Telecommunications Industry and the Advent of Reforms

As mentioned above, until 1991 the telecommunications utilities in India was provided by a state owned monopoly which worked under the DoT, an arm of the Ministry of Communications. With India suffering a payments crisis in 1990 and the loan requirements provided by the IMF-World Bank ridden with conditionalities, lot of committees were set up to recommend reforms in different sectors in India. The Ministry of Communications set up the Athreya Committee to look into the reorganization of DoT⁴⁵. The Committee recommended that the creation of MTNL was a failure and it should be remerged with the parent organization. It also recommended that the policy making role of DoT should be separated from its operational role. It also advocated that the value-added services be opened up to

⁴⁵ For details see Desai (2006).

private enterprises and co-operatives. However, of the crucial issue of reorganization of DoT, there was no consensus. The Athreya Committee had suggested major changes in the structure of DoT, including selling of minority stakes to the public. But this was opposed by DoT and the proposals of the Athreya Committee were buried.

Even though the finance ministry wanted that the communications ministry comply with the conditionalities of the World Bank and thus pave way for loans to the telecommunications sector, the communications ministry did not allow private investment in any of the wireline telephone services nor did it agree to the corporatization of telecommunications utilities and any divestment of minority stakes to the public. It only agreed to introduction of private and co-operatives in value-added services, namely, electronic and voice mail, data, audio and video text messages, videoconferencing, radio paging and mobile services. However, it should be kept in mind that while considering mobile services as value-added services the communications ministry believed that most calls to and from mobiles would be within its own wireline subscribers. This would result in additional profits to it.

The long waiting list of telephones was the most convincing argument given for the entry of private players in mobile telephone operations. During 1989-90, 415,000 new lines were given. At this rate it would have taken over four years to exhaust the waiting list of 1.7 million. DoT accelerated the installation of new lines to counter the looming threat of private players in wireline services. It installed 987,000 new lines in 1992-93 and further 1.229 million in 1993-94, but the waiting list failed to shorten as more people were encouraged to apply for telephones as more telephones were introduced and the waiting list failed to shorten.

The reform in the Indian telecommunications sector began in 1991 when foreign investment was welcomed and exchange level switch manufacturing was opened up to the private sector. Prior to 1991, DoT bought all its equipment and cables from SOEs. The prices were negotiated and they were cost plus. However, with the

emergence of multiplicity of producers, including the SOEs, led to a situation of monopsony for DoT. Open tenders showed that the supplies could be had at prices 25% - 75% than those charged by the monopoly SOEs. Along with this, DoT's investment rose dramatically from US \$ 600 million in 1991 to over US \$ 2 billion in 1995-96 and would rise to US \$ 3 billion in 1997-98⁴⁶. However, the provision of telephone services was retained as a state monopoly. At the time it was perceived to be an adequate strategy for telecommunications utilities' development. However, the focus of policy makers to improve foreign investment in equipment manufacture did not help in the growth of telephone lines. Further reforms in the telecommunications sector in response to this shortfall led to the rejection of emphasis on investments in manufacturing and in favour of enabling private investment in telecommunications services. This was not an easy proposition due to the opposition from the state-led incumbent (DoT) and unions. However, gradually the idea of private provision in basic telephone services came to be politically accepted and a route for accessing private investment.

Reforms in Telecommunications Services

When private players were first introduced in 1992, the goal of the policymaker was not to allow competition in basic services but instead supplement it by providing premium services like mobile services, at high prices. DoT invited bids for mobile services in the four metros in January 1992. Applicants had to bid for the lowest rent and no objective criteria were specified. The outcome of this bidding process got entangled in legal hassles with some applicants, whose applications were rejected going to the Supreme Court. The entire legal process ended in October 1994 with the first cellular services in the metros starting in August 1995. The license fees were modest and the urban population being relatively well-off, the cellular operators in the metros survived (although five of the eight sold out within few years). This legal imbroglio relieved DoT of the pressure on allowing private entry for some years.

⁴⁶ Chowdary, T. H. (1998): "Politics and economics of telecom liberalization in India", *Telecommunications Policy*, Vol. 22, No. 1.

Licenses were given to two bidders from each of the four metros – Delhi, Calcutta, Bombay and Madras – in July 1992. A time schedule of minimum license fee was specified for every city (Table 2.2). Metro cellular operators were given a year’s grace period during which they did not have to pay any license fee. A ceiling of Rs 156 a month was set on rental, on the basis of bids, which was much below the license fee of Rs 5,000 a year per subscriber, later raised to Rs 6,023. DoT was thus able to ensure that over 60 percent of the license fee would have to be financed from the call charges. It also placed a ceiling on call charges for cellular service providers. The standard rate was Rs 8.40 per call with a peak rate twice as high and an off-peak rate half as high. The peak wireline charge in 1994 was Rs 1.40 per call which was chargeable after the total calls had exceeded 200 in two months. Also the initial security deposit could not exceed Rs. 3,000. The low rentals and the low security deposits ensured that the call charges of the cellular operators would be a high multiple of wireline call charges.

Table 2.2: Metro Cellular License Fee, 1994

Metros	Bombay	Delhi	Calcutta	Madras
Licensees	BPL Telecom Maxtouch	Bharti Cellular Sterling	Usha martin Modi Tekstra	Skycell RPG Cellular
Annual License Fees (Rs million)				
Year 1	30	30	15	10
Year 2	60	30	30	20
Year 3	120	80	60	40
Year 4-6 ^c	180	120	90	60
Year 7- ^c	240	160	120	80

Note (c): The operator was to pay the annual license fee or Rs 5,000 per subscriber, whichever was higher.

Source: Desai, A. V. (2006): “India’s Telecommunications Industry”.

On the other hand, the finance ministry argued that DoT’s resources needed to be supplemented by private investment in order to improve India’s low teledensity⁴⁷. It got the World Bank to finance a study of private entry in basic services to be done by Industrial Credit and Investment Corporation of India (ICICI). DoT also set up a

⁴⁷ Teledensity is defined as the number of wireline phones in use for every 100 individuals living within an area.

committee, headed by G. Murthy, to crystallize its views⁴⁸. The proposals of the Murthy Committee were such that no private investors would be attracted by it and on the other hand, the proposals of ICICI were such that they were not acceptable to DoT. However, the ideology of both the committees formed the basis of the National Telecom Policy announced in 1994.

The main argument of the National Telecom Policy was that the government was unable to cope up with the investment requirements of telecommunications and thus private investment had to be allowed. The demand for telephones i.e. number of telephones plus the waiting list, had increased from 7 million in 1992 to 10.5 million in 1994. The government argued that if the demand continued to at such a fast rate, it would not be able meet it and therefore, private investment was needed. Private investment had been tried out for metro cellular license and where to be extended further. Wireline services were also to be brought into the fold, where it would be accompanied by a common tariff and revenue sharing. The National Telecom Policy specified criterion for selecting private players, even though it did not mention about competition or licensing by circles or Short Distance Charging Areas (SDCAs)⁴⁹.

In the licensing policy for private operators neither the Murthy nor the ICICI models were followed. Instead of SDCA or a district, a circle or state was considered to be the minimum geographical area for licensing. Even though the bids were invited at different stages, with entry conditions differing at each stage, the bidding process had three things in common. The bidders were required to have command over large amounts of capital and ensured this by asking for large bank guarantees for failure. Second, they required the bidders to be companies to be registered in India and have foreign telecommunications operators as joint venture partners with Indian majority. Further, the companies were required to give undertakings on minimum investment, rollout, universal service obligations, etc.

⁴⁸ For an in depth analyses of the two reports see Desai (2006).

⁴⁹ For details see DoT., (1994).

The bids for 21 circles – mostly equivalent to states but excluding the metros – were invited in January 1995 in accordance to the National Telecom Policy of 1994. The bidders had to be companies registered in India with paid-up capital exceeding Rs 1 billion and net worth exceeding Rs 10 billion. They had to have foreign shareholders with experience in telecommunications and whose equity share must be between 10 percent and 49 percent. The ceiling on charges in metros was to be applied on them as well. Two licenses for each circle were issued. Even though the capital requirements would have ensured that only the big capitalist would be able to apply, the conditions were loosely interpreted and a number of small players were able to get licenses. At the same time bids for 15 year wireline licenses were also called and opened. The metro licenses already placed formed the basis of the rentals and the call charges of the private wireline operators. The level of income and development of states determined the bids by the private operators. Class A circles – the richer states – attracted on average 7 bids, Class B and Class C circles – small, outlying and relatively underdeveloped states – attracted one or two bids.

Even though the terms imposed on the cellular and the private wireline operators were different, they resulted in the same outcome – unviability. Between the time when the bids were invited and the time where licenses were given, there was a major change in the demand conditions. When the bids were invited the waiting list of telephones was over two years. Though the demand was more in the outlying areas than in urban areas, where the cellular operators would have wanted to concentrate, it indicated excess demand and a potential good business for the private operators. As mentioned earlier, the ceiling imposed on the rentals to be charged by the cellular operators forced them to levy the highest call charges allowed by DoT. By the time the private players could provide service, the waiting list had fallen under a year and was rapidly shrinking (Table 2.3). The possibility of getting a wireline telephone had improved considerably, as DoT was giving telephones at a frantic rate. This meant that the private players had to either sell telephones to customers who did not intend to have one or convince the wireline customers to take a mobile phone.

Table 2.3: Rollout of Telephone Lines (DoT & MTNL), 1990-96

	Financial Year Ending 31 st March						
	1990	1991	1992	1993	1994	1995	1996
Number of lines (000)	4,589	5,074	5,810	6,797	8,026	9,795	11,978
Waiting list (000)	1,713	1,961	2,290	2,846	2,497	2,153	2,277
Number of new lines (000)	415	485	736	987	1,229	1,769	2,183
Waiting list (months) ^d	50	49	37	35	24	15	13

Note (d): New lines installed during the year divided into the waiting list and multiplied by 12.

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

The interconnection charges⁵⁰ imposed by DoT were also one-sided. The licensing agreement did not specify any interconnection charges and were supposed to be fixed in later negotiations. However, in September 1996, DoT issued an administrative order on interconnection charges. The arrangement introduced by it was called Receiving Party Pays (RPP). However, it was RPP only for calls origination from DoT network and terminating on cellular operators. Whichever direction the call went, the cellular subscriber had to pay for it. On the other hand, subscribers calling within DoT's network would pay less than the cellular subscribers. Thus, the interconnection charges created a kind of tariff barrier around DoT network. Since the cellular operators earned nothing from DoT on calls originating on DoT network, they had to charge their own customers the terminating costs. This, however, led to cellular subscribers not receiving calls in their cellphones but instead noting down the number and calling back from the nearest wireline telephones. The cellular operators, thus, earned little revenue. Also DoT did not pay any license fee which the cellular operators had to pay. The cellular operators had to hand over the lucrative trunk and international calls to DoT. They were given only one point of interconnection in a circle. So even if cellular operators had licence for two adjoining circles, their subscribers were charged trunk call rates for local calls between DoT and private operators if the point of interconnection was not in the same city. This along with the

⁵⁰ In a multi-operator environment commercial and technical arrangement between operators are required in order to enable customer of one service provider to access the customers of another service providers. These are known as interconnection arrangements.

low controlled rentals meant that the services of private operators could not be profitable.

It is true that the private cellular operators failed because they had bid unrealistically high license bids, which resulted in their total costs exceeding revenues. However, it should be kept in mind that the licensing conditions and the interconnection charges ensured that the revenues of private cellular operators would fall short of their costs. The reason for the failure of private wireline operators was somewhat different. When the bids for private wireline licenses were called the waiting list for wireline telephones was 2.5 million. However, DoT accelerated the installation of new lines (Table 2.3) and could pick from a long waiting list thereby reducing the demand from the private wireline operators. The private wireline operators had to install a certain proportion of telephones in rural areas where the cost of installation was high. Further, they could not charge more than DoT's wireline services. Their business had become unviable even before it started. Only two basic operators started services on a limited scale.

Setting up of the Regulator and the New Telecom Policy of 1999

The communications ministry asked ICICI to study the setting up of a regulator in May 1993, with the report being submitted in January 1994. A bill to set up a regulator on the basis of the ICICI report was drafted and passed in January 1997. A five member Telecom Regulatory Authority of India (TRAI) was set up in March 1997. In its first consultation paper, TRAI noted the precarious financial position of the private operators and concluded that if they were to be made viable, their respective segments needed to be made profitable and DoT's arbitrary interconnection charges would have to be modified and set according to actual costs⁵¹. TRAI saw the huge surplus that DoT was earning from long-distance calls and which DoT used to expand its capacity and give cross-subsidies to individual subscribers. The cross subsidies combined with underpricing of residential telephones made private

⁵¹ TRAI. (1997).

operators uncompetitive. TRAI was of the view that metro cellular operators could be made viable if they were allowed to raise their rentals and reduce their call charges.

TRAI made sweeping changes to the tariff structure of DoT⁵². It reduced DoT's free calls from 150 every two months in urban areas to 120 and 250 every two months in rural areas to 150. It also reduced DoT's five rising-charge slabs to two – a concessional slab of 500 calls every two months for which rural subscribers paid Rs 0.80 and urban subscribers Rs 1.00 per call. All calls above this were charged at Rs 1.20 per call. TRAI kept the rentals of the new group it formed (low-use subscribers) to Rs 20-250, depending on the size of the exchange. For rest it proposed a phased increase to Rs 120-310 a month. While DoT treated calls between SDCAs within a circle as trunk calls, the cellular operators charged the same rates within a circle. In response to competition from cellphone operators, in August 1998, DoT announced that calls to adjacent SDCAs will be treated as local calls. However, TRAI replaced this new definition of local call areas of DoT by a radial circle of 50 km. It also reduced seven distance-slabs to four and reduced the ratio of maximum long distance call charge to local call charge from 90 to 72. But, there were no special measures for private wireline operators as TRAI was of the view that they cannot be rescued by changes in tariff structure.

TRAI's functioning and adjuration did not go unchallenged. DoT and MTNL challenged TRAI's authority in two important cases. The cellular licenses of the private operators had specified the use of Groupe Speciale Mobile (GSM⁵³) technology. Observing the rapid increase of cellular subscribers in Delhi and Bombay, MTNL decided to start a cellular service itself. In November 1997, MTNL announced its Code Division Multiple Access (CDMA) based cellular service. At that time CDMA was more economical in its spectrum usage. If it was used to connect

⁵² TRAI. (1998)

⁵³ Originally GSM was Groupe Speciale Mobile. Later it was abbreviated as Global System of Mobile Communication.

Wireless in Local Loop (WLL)⁵⁴ or fixed wireless, it reduced costs of service providing. But it was not restricted to such usage only. CDMA could be used as a portable cellphone, just like GSM.

The Cellular Operators' Association of India (COAI) moved TRAI against this in January 1998. TRAI ruled that government must seek recommendation from it on issuing new licenses, though the government did not have to follow TRAI's advice. MTNL appealed to the Delhi High Court against this order. The judgement went against TRAI and it excluded TRAI from any role in licensing and also left unresolved COAI's complaint that its members were forced by their licensing conditions to use GSM technology and that the government was discriminating in favour of its own company. The implications of this judgement was seen when MTNL started its cellular services using CDMA technology with charges much below than those of its private competitors.

As discussed earlier, the RPP policy of DoT reduced cellular operators' revenue per subscriber (the subscribers got discouraged from receiving calls on their cellphones and instead used to note down the number and call back from the nearest wireline telephone). TRAI proposed a change in the existing arrangement. As was the case with call amongst wireline subscribers, if a wireline subscriber called a cellular subscriber the caller would have to pay. It was called the Calling Party Pays (CPP)⁵⁵. In August 1999, TRAI announced that CPP would be introduced from November 1999. DoT challenged TRAI's order in the Delhi High Court and won. The Court ruled that the licensing agreement that DoT had with cellular operators specified that DoT did not have to pay access charges to the latter. It further ruled that TRAI could not lay down terms and conditions to service providers on introduction of telecom

⁵⁴ Wireless local loop (WLL), is a term for the use of a wireless communications link as the last mile connection for delivering plain old telephone service (POTS) and/or broadband Internet to telecommunications customers. In the Indian context it was considered as a telephone that was not portable and stayed at the same place.

⁵⁵ TRAI. (1999a).

services, installation of equipment, technology and regulate as regards the telecom industry. According to the Court, TRAI's powers in these regards were just recommendatory and not binding on the government.

The result of these judgements was shattering as it deprived the new entrants the protection of the regulator and the judicial system while leaving them at the mercy of DoT. The judiciary acted in a way so as to deprive the regulator of essential powers. The judgement essentially weakened the role of the regulator as an arbiter between private operator and DoT.

The private operators did not pay their license fees. They complained that DoT had not given them interconnection and that it was not carrying their calls. On the other hand, DoT threatened to cash their bank guarantees. The banks, on the other hand, would have not been able to recover the guarantee money because the private operators had hardly any assets. So the banks would have lost money and most of them were owned by the government. Also the private players were mostly big capitalists with foreign partners and financiers. It, thus led to a politically precarious situation for the government who had plenty of interest in the well-being of the private industry. In November 1998, the government appointed a Group on Telecommunications, which was an interministerial body and had DoT representatives.

The cellular operators had defaults totalling Rs 20 billion and the wireline operators Rs 7 billion. Among their guarantors were Bank of America, Deutsche Bank, ABM Amro, etc. A solution – either liquidation or relief – was becoming unavoidable. DoT was keen to cash their guarantees and asked the private operators whether their licences should not be forfeited if they did not pay. The government pre-empted this move and constituted the Group on Telecommunications, designed to overcome the monopoly of DoT over telecom policy. It issued the New Telecom Policy, which superseded the National Telecom Policy issued in 1994, on March 31, 1999. The New

Telecom Policy showed, not only, the political influence of the private telecommunications operators but also proposed a bailout formula for them. It sought to restore TRAI's power to discipline the incumbent⁵⁶. Further, it also proposed separation of telecom policy making from government telecommunications business. It also laid the ground for the corporatization of DoT.

The provisions of the New Telecom Policy were able to save the private operators. However, the decision of the Delhi High Court on the tariff structure (CPP) and on TRAI's jurisdiction neutralized the effect of the New Telecom Policy as it did not have any legislative sanction. To counter this, the government issued an ordinance on January 24, 1999, which deprived the High Courts of jurisdiction over telecommunications. Instead the government set up a Telecom Disputes Settlement and Appellate Tribunal (TDSAT) to hear appeals against the directions of TRAI and adjudicate disputes. Appeals from TDSAT would go directly to the Supreme Court. The ordinance also freed TRAI and TDSAT from audit by the Comptroller and Auditor General (CAG). It also brought DoT under TRAI's directive powers and gave statutory instructions to the government to consult TRAI on matters relating to licensing. The ordinance breathed new life into TRAI. The new TRAI retreated on points on which it was at conflict with DoT, especially WLL and CPP.

After the announcement of the National Telecom Policy of 1994, where competition was introduced in wireline and cellular services, DoT set up a committee to examine its organization and suggest reforms. The committee proposed division of DoT into two – a small Telecom Commission which was to look after policy and planning and the rest of the organization to be a corporation which was to look after operations. The corporatization happened five years later in two stages. First, in September 1999, telecommunications services were separated from DoT into a Department of Telecommunications Services (DTS). In the second stage, DTS was corporatized into

⁵⁶ DoT., (1999).

Bharat Sanchar Nigam Limited (BSNL) in October 2000. BSNL's structure was quite similar to that of DoT.

Financial Failures

By 1998 eight cellular operators and all wireline operators except one were in default of their license fees to DoT. Bureau of Industrial Cost and Prices (BICP) and ICICI studied the finances of the cellular operators. While BICP recommended an increase in the rentals, ICICI recommended a two year moratorium on license fees and extension of the license period from 10 to 15 years. COAI asked to increase the term of license to 20 years. It also sought protection from courts against cashing of their bank guarantees by DoT. TRAI studied the cellular operators and summarized the factors behind their financial problems.

- The Cellular Mobile Service Providers (CMSP) had incurred huge capital expenditure and had overprovision of capacity in the Mobile Switching Centres (MSC) in some cases. There was underutilization of installed resources. The projects were making losses and payback would start in the seventh or the eighth year. Tariff reduction of leased lines and sharing on infrastructure among operators may show change in the trends.
- Subscriber base was lower than projected and was growing on a small base.
- The Average Revenue Per User (ARPU) was low due to low revenue growth and that operators were trying to control operational expenditures which was about 75 percent of revenues on an average. ARPM in metros was high. Fixed license fee was a heavy burden and that financial closures had been achieved in only a few circles. Extension of license tenure by 10 years and percentage of revenue share as license fee for the extended period was critically important in achieving financial closures⁵⁷.

⁵⁷ TRAI, 1999b.

The factors that affected the performance of private operators, as enumerated by TRAI, do explain what went wrong. However, a look at Table 2.4 helps in diagnosing the problem better. High license fees and interconnection charges of DoT were not the only reason for the losses made by operators. Nor was excessive borrowing, which in most cases was for financing losses. In most cases losses exceeded interest payments and network charges taken together. It is widely agreed that telecommunications require heavy investment and building in of capacity before the returns start to come in. The analyses of financial losses of operators relied heavily on the above argument and were of the opinion that the finances of cellular operators would improve over time and what they needed was an extension of license period.

Table 2.4: Components of Cellular Operators' Expenditure, 1997-98^e

	Network Charges	Operating Costs	Depreciation	Interest	Loss
Metros					
Hutchison Bombay	19.2	47.2	13.9	19.7	32.2
BPL Bombay	16.3	46.3	10.2	27.2	18.5
RPG Madras	9.1	39.8	25.5	25.5	55.6
Skycell Madras	12.7	33.6	26.5	27.2	60.2
Circles					
Fascel Gujarat	41.7	20.0	14.9	23.4	78.2
Birla Mah & Gujarat	49.1	34.4	12.8	3.7	76.1
J.T. Mobile Karnataka	42.9	28.6	5.8	22.7	79.4
Modi Karnataka	7.1	26.3	36.6	30.0	67.8
Aircel Digilink Haryana	0.0	35.7	26.2	38.1	87.6
Aircel Digilink UP (E)	0.0	31.7	22.7	45.6	96.6
Koshika UP (E)	0.0	64.6	35.2	0.2	31.1
Koshika UP (W)	0.0	59.5	40.5	0.0	59.8

Note (e): All figures are percentage of total expenditure.

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

The analyses by different institutions essentially avoided the inevitable conclusion that the industry was oligopolistic and that the actions of the incumbent influenced the profits of the new entrants (private operators). The demand facing the private operators was dependent on the number of telephones that the incumbent gave -- the more telephones the incumbent gave the less would be the demand from private operators. DoT, through its interconnection charges and license ceilings ensured that the private operators would have to charge more than DoT for calls. This, combined

with the absence of a regulator which could discipline the incumbent and usher in competition, made the private operators unviable.

Moving to the New Licensing Regime (Revenue Sharing Regime)

As discussed earlier, metro, cellular, and wireline licenses were issued, as per the provisions of the National Telecom Policy of 1994, to private operators. However, most of the operators ended up with financial problems. But the provisions of the New Telecom Policy of 1999 made certain crucial difference to the finances of the private operators. CMSP operators were required to pay a one time entry fee. The entry fee and the basis for selection of additional operators would be recommended by TRAI. Apart from the one time entry fee, CMSP operators were required to pay licence fee based on a revenue share. All circle operators were required to pay 2.8-2.9 years' license fee at the old rates (some operators, who had won extremely cheap bids, were required to pay up to 6.6 times their license fees). Table 2.5 summarizes the license fees that cellular operators had initially bid and what they actually paid. They, essentially, paid the arrears of license fees accumulated since they got the licence. Once the operators had paid this, they were allowed to migrate to a proportional change on their revenue.

Table 2.5: Fees Paid by Cellular Operators for Migration to the Revenue Sharing Regime, 1999 (Rs million)

Circle	Name of Operator	License Fee Bid	License Fee Accepted	Years
HP	Bharti Telenet	149.6	149.6	2.9
Gujrat	Birla AT&T	17941	17941	2.9
Maharashtra	Birla AT&T	16577	16577	2.9
Tamil Nadu	BPL Cellular	8360	8360	2.9
Maharashtra	BPL Cellular	14630	16577	2.8
Kerala	BPL Cellular	5170	5170	2.9
Haryana	Escotel	2458.6	2400	2.9
Kerala	Escotel	3848.3	5170	2.9
UP(W)	Escotel	4062.1	4062.1	2.9
Gujarat	Fascel	12292.5	17941	2.8
Karnataka	Modicom	13930	13930	2.8
Punjab	Modicom	12660	12660	2.8
AP	J.T. Mobile	10010	10010	2.9
Punjab	J.T. Mobile	9145	12660	3.9
Karnataka	J.T. Mobile	13200	13930	2.7
Bihar	Koshika Telecom	1365.3	1365.3	0
Orissa	Koshika Telecom	892.2	892.2	0
UP(E)	Koshika Telecom	2108.8	2108.8	0
UP(W)	Koshika Telecom	2582.1	4062.1	0
Assam	Reliance Telecom	13.2	13.2	2.9
Bihar	Reliance Telecom	26.4	1365.3	6.6
HP	Reliance Telecom	13.2	149.6	2.9
MP	Reliance Telecom	56.1	510	2.9
Northeast	Reliance Telecom	13.2	19	6.4
Orissa	Reliance Telecom	26.4	892.2	6.6
WB	Reliance Telecom	420	420	2.9
MP	RPG Cellcom	510	510	2.9
Rajasthan	Hexacom	1610	3820	2.8
Northeast	Hexacom	19	19	6.4
Haryana	Aircel Digilink	2400	2400	2.9
Rajasthan	Aircel Digilink	2100	3820	2.9
UP(E)	Aircel Digilink	2100	2108.8	6.6
Tamil Nadu	Srinivas Cellcom	4500	8360	0.5
AP	Tata Cellular	8580	10010	2.8
Metros				
Delhi	Bharti		80-160	6.1-12.3
Delhi	Sterling		80-160	4.4-8.8
Bombay	BPL		120-240	3.7-7.4
Bombay	Hutchison Max		120-240	3.5-7.0
Calcutta	Modi Telstra		60-120	2.6-5.2
Calcutta	Usha Martin		60-120	2.2-4.4
Madras	RPG		40-80	2.6-5.2
Madras	Skycell		40-80	2.6-5.2

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

DoT and MTNL were allowed to enter the mobile business. The price cuts introduced by them intensified the price competition among cellular operators. The cellular operators were already charging less than the maximum allowed by DoT before their migration to the new regime. Private wireline operators were allowed to give CDMA cellular services. The call charges of wireline operators were required to be same as that of DoT's wireline services, which was much below than that of CDMA operators. Cellular operators' revenue-share requirement was initially fixed at 12 percent and that of wireline operators' at 12, 10 and 8 percent for A, B and C circles respectively. However, by January 2001 the cellular operators' share was made equal to those of cellular operators, when the latter was allowed to give WLL connections. The private operators were also no longer required to route intracircle calls through DoT and MTNL. The private operators were allowed to build their own network within their circle boundaries. The monopoly that government had in domestic long-distance was abolished in April 2001 and in international traffic in April 2002. The call charges in both fell and private gained at the expense of both DoT and VSNL.

The cellular operations became profitable as a result of the changes in policy brought about by the New Telecom Policy. However, this unleashed a bout of intense price competition, which essentially favoured the large operators who could realize network economies and access to finance to order equipment in bulk. The smaller players operating in one or two circles and those who did not have access to large amount of funds were eliminated. Thus, the market share of those few operators who had the money to buy licenses increased and there was increased concentration in the telecommunications industry. By 2002, amongst cellular operators, five groups – Bharti, Hutchison, Reliance, Escorts and Idea – held 45 of the 55 cellular licenses. Six houses – Bharti, Reliance, Idea, Tatas, Escorts and Hutchison – held 66 of the 84 wireline licenses⁵⁸. Most of the mergers and acquisitions occurred after the telecommunication companies had solved their liquidity problems. Network economies and economies of scale were the primary factors that drove these deals,

⁵⁸ TATAs and Birla merged their cellular networks to form Idea. However, TATA retained its wireline services.

which meant that a larger network carrier while carrying more of its calls passed on fewer to other networks.

Sources of Finance and Foreign Participation

In the initial bids for metro cellular licenses there was no stipulation on equity holding. However, in subsequent license auctions Indian companies were required to have at least 51 percent equity in the bidding company. They were also to have foreign partners, with experience in telecommunications, who had to take at least 10 percent equity in the bidding company. Foreign equity was considered important for Indian operators as foreign equity holders not only shared the risks but also as most of the equipment was imported, foreign equity provided the finance for it. Even though it was possible to borrow abroad when private operators were allowed to provide services in different circles, the Indian operators preferred foreign equity because it was a costless form of finance until the business became profitable. The Indian operators thus preferred foreign equity as much as possible under the rules and preferably from a single experienced telecommunications partner. Most of the Indian operators took the maximum foreign equity allowed i.e. 49 percent. Those operators who did not have the maximum allowed limit was because either they did not need it (as they had access to sufficient finance on their own) or they were unattractive partners or their licenses they acquired were not attractive. Table 2.6 summarizes the initial equity financing of major private telecom operators.

The foreign equity that the Indian operators took got absorbed in the early losses. The airtime charges as well as the rentals, fixed by DoT and TRAI, were only able to cover between 4-30 percent of operating expenses of circle cellular operators. The investments in intercity transmission facilities raised the costs considerably. Further, to be able to provide services in a circle, to which a cellular operator had license, required them to invest in infrastructure so as to be able to connect all subscribers in the circle before they were able to start operations. Shifting to the revenue sharing regime improved the financial performance of private operators dramatically. Other

factors also played a role in this⁵⁹. The permission to private operators to connect among themselves improved revenues. The introduction of prepaid cards made it possible for consumers to not only avail services without paying much initial charge but also they were able to buy services in amounts they required and did not have an obligation to keep paying bills. In the smaller and relatively poorer Circle C the growth of cellular subscribers outstripped that of wireline connections.

Table 2.6: Initial Equity Financing of Major Telecom Operators*

		Indian Investors		Foreign Telecom Operators			Other Foreign Investors
		Promoter	Other	1	2	3	
Bharti	Bharti Telenet	67		33			
Bharti	Bharti Cellular	30		25	20	5	20
Birla	BACL	51		49			
BPL	BPL Mobile	49		39			12
BPL	BPL Cellular	51		49			
Escorts	Escotel Mobile	51		49			
Essar	Essar Commvision	51		10			39
Essar	Aircel Digilink	60		30	10		
HFCL	Fascel	43	11	16			30
Hutchison	Hutchison Max	51		24.5	24.5		
Hutchison	Hutchison Essar South	51		49			
Ispat	Hughes Telecom	51		49			
Modi	Spice Communications	51		39	10		
Modi	Modi Telstra	50		50			
Parasrampur	J.T. Mobile	51		26	13	10	
Jhavar	Koshika Telecom	66		34			
Jhavar	Usha Martin	61		39			
Reliance	Reliance Infocomm	100					
Reliance	Reliance Telecom	90		10			
RPG	RPG Cellcom	51		49			
RPG	RPG Cellular	50		37			13
Shyam	Hexacom	40	30	10	10		10
Sterling	Sterling Cellular	51		30	10		9
Sterling	Srinivas Cellcom	51		10			39
Tata	Tata Teleservices	51		39			10
Tata	Tata Cellular	51		39			10
Thapar	Skycell	51		24.5			24.5

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

⁵⁹ TRAI., (2002).

After migration to the new regime, the advantages of larger size became evident. In due course the foreign investors also started favouring large groups. Under normal circumstances an acquirer would take control either by buying out the Indian promoter. If the company was not in good shape then the foreign buyer would sell out. Hutchison, a Hong Kong firm, bought out foreign partners by arranging with an Indian partner – Essar in most cases – to take control over the bought firm's Indian equity. The large groups used their financial clout to buy out small operators. Not only did the proportion of Indian equity increased during this process of consolidation by larger groups but also there was induction of new capital from local and foreign financial institution.

Foreign direct investment made in Indian telecommunications between August 1991 and March 2002 was Rs 95.6 billion (Table 2.7). Atleast Rs 71.4 billion went into equity and two-thirds of it went into holding companies. Most of the major telecommunications company of both, industrial as well as developing countries were involved⁶⁰. Investment to the tune of Rs 129.5 billion came from government financial institution. The telecommunications' promoters brought in equity from their captive company, attracted funds from foreign partners (as much as possible as per the rules) and took long term loans from the government financial institutions. This resulted in involvement of the foreign partners and the government institutions in the fortunes and developments of the telecommunications industry in India. The telecommunications promoters were thus able to put pressure on the government whenever they got into difficulty.

In the early 1990's, when DoT insisted on having foreign equity, there were not many countries that had liberalized their telecommunications system, privatized their national operators, allowed competition in domestic markets and allowed their telecommunications companies to invest abroad. US was one of the foremost country which had embarked on such a trajectory. As a result, over a dozen US companies

⁶⁰ For details of the foreign companies see Desai (2006).

took stakes in telecommunications companies in India. These companies were not only telecommunications companies but also equipment manufacturers and financial institutions. Since most of the Indian telecommunications operators were importing the network and cellular operators, the Indian companies did not feel necessary to tie up with foreign telecommunications partners. The government, when it insisted on foreign equity, was of the view that the Indian companies were not experienced enough and would need technical assistance. However, technical assistance could also have been given by equipment manufacturers and also could be built up internally by recruiting engineers.

Table 2.7: Foreign Direct Investment and Investment by Indian Financial Institutions (August 1991 – March 2003) (in Rs billion)

Foreign Investment in		Investment by	
Holding Companies	48.1	ICICI	58.8
Cellular Service	23.3	IDBI	25.3
Manufacturing and Consultancy	15.8	IDFC	21.7
Wireline Telephone Services	3.9	SBI	17.3
Other	5.5	IFCI	6.4
Total	95.6		129.5

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

Table 2.8 summarizes the major foreign equity investors in cellular companies. However, it only gives the initial picture. The financial failures of the private Indian telecommunication companies made many of their foreign companies keen to exit. When the performance of the Indian companies improved after the New Telecom Policy, 1999, many foreign companies exited. The bigger cellular conglomerates that emerged from the consolidation process bought out most of the foreign equity holders. Most of the foreign direct investors were bought out by 2003. The only major player that remained was Hutchison Whampoa. In 2005, the government raised the foreign equity level to 74 percent with the view that the investment requirements of

the telecommunications industry would be high as it was growing at a rapid rate.

Table 2.9 shows the FDI in telecommunications.

Table 2.8: Major Foreign Equity Investor in Cellular Companies

Investor	Country	Stake (%)	Cellular Company	Business House
National Incumbent				
AT&T	USA	49	Birla AT&T	Birla
NTT	Japan	49	Basic	R.P.Goenka
Telstra	Australia	47.6	Modi Telstra	Modi
MTB	Malaysia	40	Usha Martin Telecom	Rai
Bell Canada	Canada	39	Tata Teleservices	Tata
PTC	Philippines	34	Koshika	Rai
Stet	Italy	33	Bharti Telenet	Bharti
Swiss PTT	Switzerland	30	Aircel Digilink	Sterling
France Tel	France	26	BPL Mobile	BPL
Other telephone operators				
First Pacific	Hong Kong	49	Escotel	Escorts
Vodafone	USA	49	RPG Cellcom	R.P.Goenka
Hutchison	Hong Kong	49	Hutchison Max	Max
Jasmine	Thailand	49	J.T. Mobile	Parasrampuria
Media One	USA	49	BPL Cellular	BPL
Distacom	Hong Kong	39	Spice	Modi
Shinawatra	Thailand	33	Fascel	Maloo-Nahata
BellSouth	USA	24.5	Skycell	Thapar
GMC	USA	22.5	Bharti Cellular	Bharti
Century USA	USA	19.5	Aircel	Sterling
Financiers				
Al Amin	Mauritius	49	Barakhamba	Sterling
AIG	USA	49	Tata Cellular	Tata
Cellfone	Mauritius	46	R.P.G Cellular	R.P.Goenka
Asia Pacific Infra	Hong Kong	39	Essar Commvion	Essar
Mobilvest	Mauritius	30	Sterling Cellular	Sterling
Redington	Singapore	29	Aircel	Sterling
Emtel	Mauritius	17	Bharti Cellular	Bharti
Other				
Hughes Electronics	USA	49	Hughes Ispat	Ispat
Millicom	Luxembourg	24.5	Skycell	Thapar

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

The government allowed a total composite FDI up to 74 percent⁶¹. This definition of foreign capital now included foreign institutional investors, non-resident Indians, foreign currency convertible bonds, American depository receipts, global depository receipts, convertible preference shares, and proportionate foreign investment in Indian promoters or investment companies including their holding companies. The last item

⁶¹ Government of India, (2005).

was not being counted as foreign capital in the earlier regime. The 74 percent FDI limit included almost all aspects of foreign capital invested in an Indian company. The remaining 26 percent of the equity would stay with Indian citizens or Indian companies. Ten per cent of the 26 percent Indian equity needed to be with a single Indian promoter. Proportionate foreign investment in an Indian company would be counted as part of the 74 percent foreign equity limit. In the 49 percent FDI regime, this item was considered a part of Indian capital. It was this aspect of the 49 percent FDI regime that had allowed Bharti and Hutch to go beyond the 49 percent FDI limit. The holding of Indian public sector banks and financial institutions would be considered a part of Indian equity, even if they had raised capital from abroad. Indian laws would govern foreign investors. The status of foreign holding needed to be disclosed on a six month basis.

Table 2.9: FDI Inflow in Telecommunications

Year	FDI Inflow (in Rs million)
2005	5,695.38
2006	27,759.53
2007	21,550.77
2008	51,026.09

Source: DoT, Annual Report, 2008-09.

Bharti Televentures Limited was one of the major beneficiaries from a hike in the FDI limit. It needed large doses of foreign capital to compete with larger business groups like the TATAs and Reliance. Bharti had acquired more than 65 percent foreign holding, through a holding structure, which was permitted in the current regime. These regulatory changes inspired a major investment decision by the world's fourth largest telecommunications player, Vodafone in Bharti's telecommunications business. Vodafone invested Rs 67 billion to buy a 10 percent stake in Bharti Televentures Limited. Vodafone became Bharti's fifth foreign investment partner after Vivendi, Telecom Italia, British Telecom and Sing Tel. In 2007, Vodafone invested \$ 11 billion to buy a 67 percent stake in Hutchison-Essar. Other notable

acquisitions were Malaysia's Maxis Communication's \$ 1.08 billion investment in Aircell, and Orascom's \$ 1.3 billion investment in Hutch⁶².

License Unification: Universal Licensing Regime

By the beginning of the 21st century, technological developments were removing the boundaries between different industries – telecommunications, radio, television and Internet – which were separately defined earlier, leading to their convergence. Convergence was something that was not given importance in the New Telecom Policy of 1999. However, in 2000, government drafted a Convergence Bill which was meant to replace the previous legislations and sought to combine the licensing functions of DoT and regulatory function of TRAI under one regulator. The Planning Commission set up a working group on convergence in 2000. But it limited itself to expansion of government intranet and its use for e-governance during the Tenth Plan (2002-07).

Concerns over the conditions under which fixed telephone service licenses would be merged with the cellular licenses created apprehensions over unified licensing. It essentially became a contest between the GSM operators who were dependent on foreign capital and CDMA operators who had their own deep pockets. As per the New Telecom Policy, wireline operators had been allowed to provide CDMA cellular services within a SDCA. In February 2003, GSM operators complained about Reliance Infocomm's national roaming facilities, which it was not allowed under the licensing agreement. TDSAT ruled that government must ensure the conditions of restricting WLL calls within SDCA. However, as the faulting operator was a large player with a large subscriber base, the solution adopted was to fine Reliance Infocomm (fine was assessed at Rs 15.29 billion) and in effect remove SDCA restriction for an additional license fee. Since, such a removal was unfair to the cellular operators who had entered in the same circle in the 1999 auction, TRAI

⁶² Mukherji, R. (2008): "The Politics of Telecommunications Regulation: State-Industry Alliance Favouring Foreign Investment in India", *Journal of Development Studies*, November 1.

proposed a penalty for migration to full cellular service⁶³. The recommendations were accepted by DoT in November 2003 and with their implementation all licenses were converted to combined licenses for wireline, CDMA and GSM cellular. This was the first stage of universal licensing.

The second stage of the universal licensing exercise covered activities of national and international long-distance services⁶⁴. An all India license covering basic, cellular, national long-distance, international long-distance, global mobile personal communication by satellite, cable television, direct to home satellite television, Internet telephony and TV and broadcasting services could be purchased for Rs 1.07 billion, plus a component that would vary with the area where the service was being provided. While the basic telecommunications operators favoured high entry barriers to national and international long-distance services, the smaller GSM operators desired lower entry barriers. The GSM operators argued that the proposed long distance fee would not encourage competition. While the previous fee of Rs 1.25 billion was amortised over 20 years, the current fee needed to be amortised over five years. Also bundling of national and international long-distance service fee into one fee preclude smaller operators to opt for either service. GSM operators also wanted the foreign direct investment limit to be raised to 74 percent (discussed earlier) to allow then the resources to compete with the cash rich single license long-distance operators.

There was a dramatic change in the attitude of DoT as regards favouring competition in telecommunications sector. While earlier DoT was in favour of keeping the license fee at Rs 1,25 billion (GSM operators were arguing against an amount of Rs 1.07 billion), on November 10, 2005, it issued a press statement pronouncing the policy for second round of licensing process, which respected the concerns of the GSM

⁶³ TRAI. (2003b).

⁶⁴ TRAI. (2004a); TRAI. (2004b) and TRAI. (2005a).

operators⁶⁵. The license fee for the national long distance service was reduced from Rs 1 billion to Rs 25 million and the license fee for the international long distance service was reduced from Rs 250 million to Rs 25 million. The licenses for international and national long distance services were unbundled and the total license fee was reduced from Rs 1.25 billion to Rs 50 million. Second, the requirements of net worth and paid up capital, which were Rs 25 billion and Rs 2.5 billion respectively, were each brought down to Rs 25 million. Third, the annual revenue share license fee was brought down from 15 to 6 percent. Thus, the change in the licensing regime was essentially a way to provide GSM operators greater access to finance as this had been the segment that had contributed significantly in the growth of the telecommunications sector.

Current State of the Telecommunications Sector

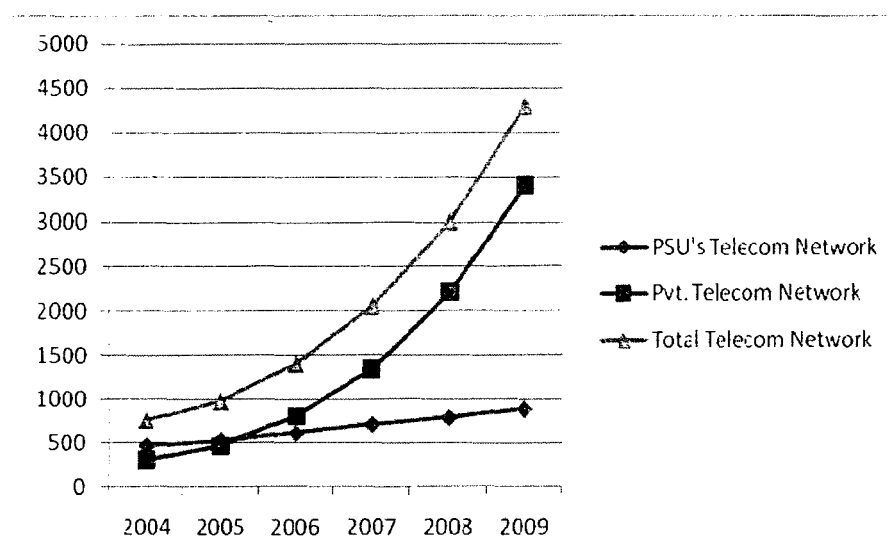
With over 1.1 billion strong population, India has become one of the most dynamic and promising telecommunications network in the world. It has emerged as one of the fastest growing telecommunications markets in the world. It has the third largest telecommunications network and the second largest wireless network, second only to China. In 1991, India had just 5 million telephone subscribers. As at the end of March 2009, there were 429.73 million subscribers (Table 2.11). Figure 2.1 illustrates the growth of telecommunications network in India from 2004. From 2006, there has been a phenomenal increase in the growth of private telecommunications network, while the growth of public telecommunications network has been modest. Evidently, it is the private players who are contributing in the growth of the telecommunications network in India.

The total number of telephones had reached 4297.25 lakh as on March 31, 2009. While 1292.33 lakh connections were added during the twelve months of 2008-09, about 108 lakh connections were added every month during 2008-09. The teledensity, as shown in Figure 2.2, has shown a sustained increase during last few years. It

⁶⁵ DoT. (2005).

increased from 26.22 in March 2008 to 36.98 in March 2009. Teledensity has risen to 36.98 by 2009, which is above the target of 15, set by the New Telecom Policy, 1999, to be achieved by 2010.

Figure 2.1: Growth of Telecommunications Networks (in lakh)



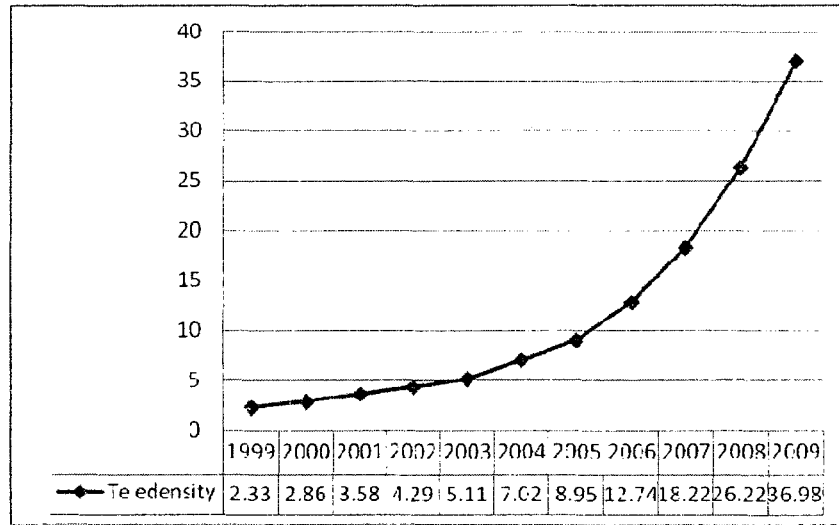
Source: DoT, Annual Report, 2008-09.

Table 2.10: Growth in Subscriber Base

Year	Subscriber Base (in millions)		Ratio of Private to Public	Growth Rate in Subscriber Base (%)	
	Public	Private		Public	Private
1998	17.80	0.88	0.05	-	-
1999	21.59	1.22	0.06	21.29	38.64
2000	26.51	2.02	0.08	22.79	65.57
2001	32.44	3.85	0.12	22.37	90.59
2002	38.16	6.81	0.18	17.63	76.88
2003	43.17	11.45	0.27	13.13	68.14
2004	46.98	30.66	0.65	8.83	167.77
2005	52.08	46.33	0.89	10.86	51.11
2006	61.08	79.24	1.30	17.28	71.03
2007	71.40	134.46	1.88	16.90	69.69
2008	79.55	220.94	2.78	11.41	64.32

Source: TRAI, Annual Report, 2007-08.

Figure 2.2: Teledensity in India



Source: DoT, Annual Report, 2008-09.

The structure and composition of telecommunications growth has undergone a substantial change in terms of wireless and wireline phones and public-private participation. The growth of wireless services has been phenomenal, with wireless subscribers growing at a compound annual growth rate (CAGR) of 75.7 percent per annum since 2003. Today, the wireless subscribers are not only much more than the wireline subscribers in the country, but also increasing at a much faster pace. The number of wireline and wireless telephones was 382.91 lakh & 66.77 lakh respectively in 2002. This increased to 379.65 lakh & 3917.61 lakh respectively in March 2009. The share of wireless phones therefore, has increased from 14.85 percent in March 2002 to 91.17 percent in March 2009. Share of private sector in total telephone connections steadily increased to 79.16 percent in March 2009 from 39.27 percent in 2004. The private sector, however, is mainly active in the wireless segment while wireline accounts for only about 1.17 percent. Private sector has been growing very fast. It grew at a rate of 79.16 percent in 2009 as against public sector which grew at the rate of 20.84 percent in 2009⁶⁶.

⁶⁶ DoT, Annual Report, 2008-09.

The rising share of private sector in overall telecommunications is also evident from Table 2.10. The ratio of private to public in terms of subscriber base crossed unity in 2006. While the growth rate in terms of subscriber base for private players has shown volatility, it is very high compared to the same for the public telecommunications utilities. As mentioned above, the public sector is more dominant in the wireline segment, while the private players in telecommunications are in the wireless services. Such kind of structure is largely due to historical reasons. The two public sector utilities, BSNL and MTNL, were dominant in the wireline segment and were allowed to provide wireless services only in the late 1990s and early 2000s.

Table 2.11: Wireline Subscribers and Wireless Subscribers (in millions)

Year	Wireline Subscribers	Wireless Subscribers	Total	Ratio of Wireline to Wireless Subscribers (%)
2004	40.02	39.69	79.71	1.01
2005	41.43	52.22	93.65	0.79
2006	41.54	98.77	140.31	0.42
2007	40.75	165.11	205.86	0.25
2008	39.42	261.07	300.49	0.15
2009	37.97	391.76	429.73	0.10

Source: TRAI, Annual Report, 2007-08 and DoT, Annual Report, 2008-09.

The subscriber base of wireline services was 37.97 million in 2009. It has been declining from 2007 as the demand for wireline telephones have reduced due to increasing shift to the wireless segment. The number of wireless telephones had reached 391.76 million by March 31, 2009. Table 2.11 shows the wireline and the wireless subscribers form 2004. As evident the growth of wireless segment had been phenomenal. While the ratio of wireline subscribers to wireline subscribers was unity in 2004, over the years the ratio has decreased owing mainly to the growth in the wireless segment.

Technological advances and regulatory provisions have increased the competition in Indian telecommunications. This can be seen in mobile and long distance services. The competitive pressure on service providers has also made them be innovative in their tariff offerings. Table 2.11 shows the reduction in tariffs for long distance

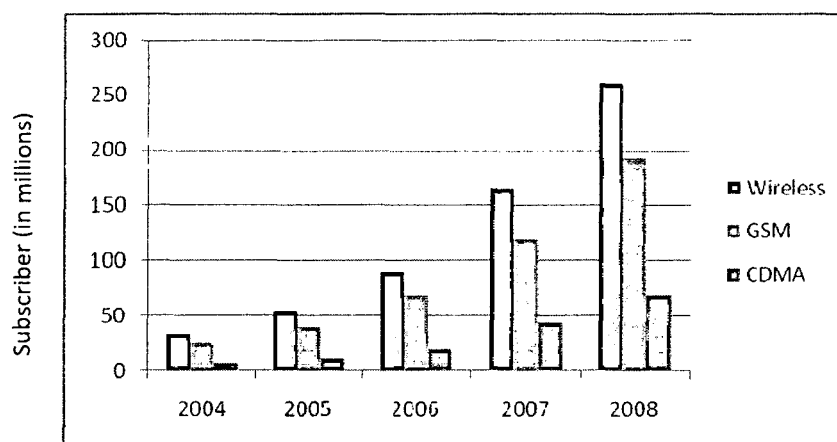
services in India between 1999 and 2008. While the tariff reduction in call distances over 200 km has been substantial, the same is not seen in the local circles, where the tariff reduction has been not in the same tune as long-distance. As compared to many countries of the world, Indian consumers have been immensely benefited from lower tariffs, which have also been a major factor for explosive growth in the sector.

Table 2.11: Reduction in Tariff, 1999-2008

Distance (km)	Decline in Tariff (%)
51 – 100	- 62
101 – 200	- 75
201 – 500	- 87
501 – 1000	- 90
> 1000	- 94

Source: TRAI, Annual Report, 2007-08.

Figure 2.4: Subscriber Growth of Wireless Service (GSM and CDMA)

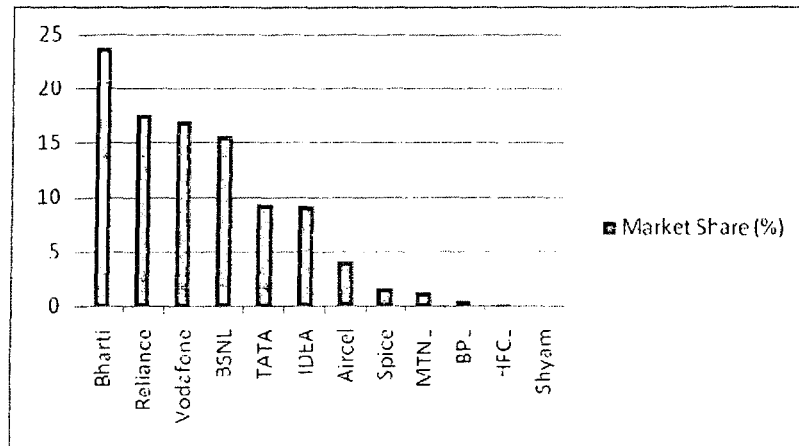


Source: TRAI, Annual Report, 2007-08.

The wireless industry crossed 261million-subscribers mark at the end of 2008. This total subscribers base of 261.07 million comprise of 192.7 million GSM and 68.37 million CDMA subscribers. During 2008 around 95.96 million subscribers were added with a growth rate of 58.12% as compared to 67.17% growth during the year 2006-07. The growth of subscriber base of wireless (including GSM and CDMA)

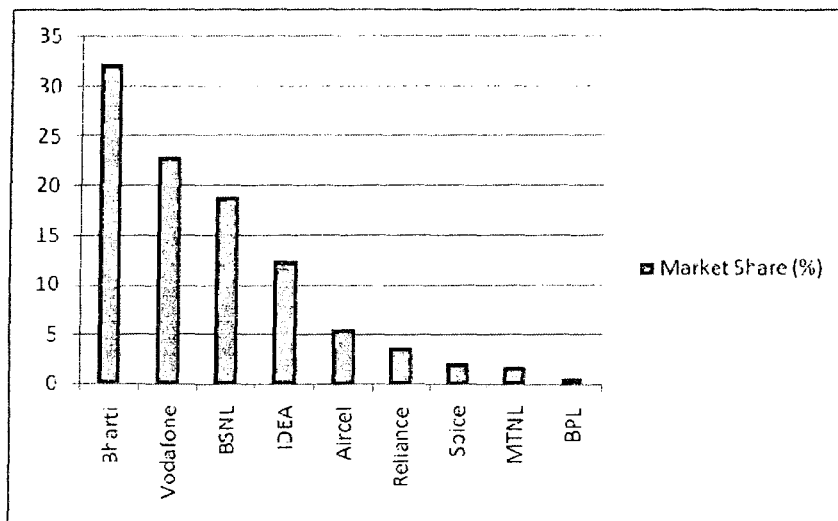
services from March 2004 to March 2008 is depicted in Figure 2.4. The market share of different mobile operators as on March 2008 is displayed in Figure 2.5.⁶⁷

Figure 2.5: Market Share of Mobile Service Providers as on March 31, 2008



Source: TRAI, Annual Report, 2007-08.

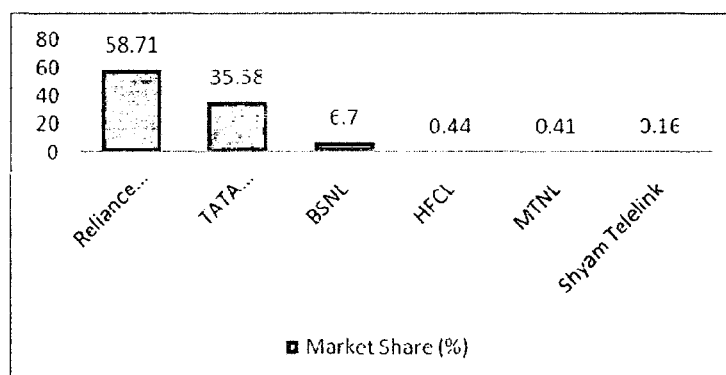
Figure 2.6: Market Share of GSM Operators as on March 31, 2008



Source: TRAI, Annual Report, 2007-08.

⁶⁷ TRAI, Annual Report, 2007-08.

Figure 2.7: Market Share of CDMA Operators as on March 31, 2008



Source: TRAI, Annual Report, 2007-08.

In the wireless segment, GSM services have reached the 192.70 million subscriber mark at the end of 2008, as compared to 120.47 million during the previous year. It added around 72.23 million subscribers during the year, registering an annual growth of 59.96%. In terms of subscriber base and market share of GSM services, Bharti with 61.98 million subscriber base remains the largest GSM operator followed by Vodafone, BSNL, and Idea with subscriber base of 44.13 million, 36.21 million and 24.00 million respectively. The market share of different GSM operators as on March 2008 is displayed in Figure (2.6). In Cellular CDMA services, in terms of subscriber base and market share, Reliance Infocomm with 38.78 million subscriber base remains the largest CDMA operator followed by TATA and BSNL with a subscriber base of 24.33 million, and 4.58 million respectively. The market share of different CDMA operators as on March 2008 is displayed in Figure (2.7).

The telecommunications industry has grown at a very fast rate in the last few years. The growth has primarily been in the wireless segment. As the tariff structure continues to fall, one might see a further increase in the share of wireless subscribers mainly to the easy availability and accessibility of its services especially in the semi-urban areas. However, one cannot miss the oligopolistic tendencies that are there in the wireless segment, more predominantly in the CDMA services.

Chapter 4

Rural-Urban Divide in Indian Telecommunications

Telecommunications as a tool for transfer of information can be crucial for the development of a country, especially a developing one. Providing information link between urban and rural areas and among rural residents helps in overcoming the distance barrier that hampers rural development. It is widely agreed that access to information is crucial for development activities, including agriculture. If information is critical to development process then telecommunications, as a means of sharing information, does not just connects people, but is a vital link in the chain of development process. Telecommunication utilities can play a significant role in rural areas where alternative means of obtaining and conveying information, like personal contact, transport and postal services are likely to be less accessible.

Rural Indian population faces the double jeopardy of not only having proper roads and public transport facilities and other infrastructure of urban areas but also being deprived of telecommunications services. Economic imbalances are not only intensified but also inequalities, which have achieved staggering proportions, increases. Low cost technologies, like wireless, are now available at reasonable prices in the rural areas. Business innovations such as pre-pay options have reduced the entry price at the lower end of the market and enabled easy access for multiple services in areas where fixed telephone infrastructure is poor.

Rural India will eventually define the core of the strength of the telecommunications industry in India as the absolute possibility of connections in rural areas is immense. Inclusion of rural users in the customer base will not only strengthen the networks of the telecommunications service providers but also deliver multiple services to the communications starved rural areas. Since the prices, both at the entry level as well as

the recurring expenses of maintenance, of wireless telephony have come down, due to the developments in the telecommunications industry, the demand of such services in the rural areas is also very high. However, the low population density in rural markets make it less viable and profitable for private operators to enter such areas and compete with the fixed line telecom rates, which are cheaper, in rural areas with a diversified market and low income levels. However, before looking at the rural-urban divide in Indian telecommunications we first look at the history of the policy prescriptions for rural telecommunications in India.

Policy Decisions for Rural Telecommunications

Providing every village in India with a single connection has not only been a fixed but also a movable target of policymakers. However, prior to 1980, the approach of policymakers was not as stated above. Due to the high profitability of telephone services the Ministry of Post and Telegraph, of which telecommunications was a part of till 1986, used this profits to cross-subsidize the popular postal services. Policymakers viewed telecommunications utilities as luxury goods. The government was of the view that the *aam aadmi* had no need for telecommunication utilities and thus investment in telecommunications should be restricted to serve government needs and few other essential needs. Investment in telecommunications came under the Five-Year Plans which gave low priority to it. This is evident from the following quote in the Approach paper to the Sixth Plan, published in 1979:

*The primary need of the people is food, water and shelter. Telephone development can wait. In place of doing any good, development of the telecommunication infrastructure has tended to intensify the migration of population from rural to urban areas. There is a need to curb growth of telecom infrastructure particularly in the urban areas.*⁶⁸

⁶⁸ As quoted in Dossani, R., (2002): "Telecommunications reforms in India", *India Review*, 1:2, 61 – 90.

As has been discussed earlier, the Indian telecommunications utilities were a state controlled monopoly, with DoT responsible for the expansion of telecommunications services in India. From the mid-1950s to the 1980s, the Indian telecommunications organization vehemently opposed introduction of competition in telecommunications. One of the justifications given was that the objective of the state was to serve the poor. For the telecommunications utility it meant installing telephones in every village. This objective was used to lend sanctity to the government telecommunication organization as long as there were villages which still needed to be connected by telephones. So the government installed telephones in rural areas, but as slowly as possible. This policy objective is still one of the top priorities of the official government policy.

A change in perspective came in the 1980s in the industrial countries. Infrastructure companies which were earlier viewed as natural monopolies were considered to be fit for competition, however, in the presence of a regulator. This model of regulated competition was applied in Indian telecommunications amongst other industries. The advent of competition in the telecommunications industry has been primarily due to the advent of wireless technology. The communications ministry initially did not allow private investment in wireline services. However, it accepted the Athreya Committee recommendation of allowing private investment and co-operative enterprises in value added service (it regarded mobile services as value added services).

The National Telecom Policy of 1994 specified the criterion for the introduction of private investment in telecommunications utilities. The main emphasis of the National Telecom Policy was the development of telecommunications services in India in accordance with the new economic policy adopted by the government as it was perceived that best quality of telecommunications services was vital for the success of such a policy. It essentially set up guidelines for the entry of private telecommunication players both in the wireless as well as in the wireline segments. The private wireline operators were required to connect all district headquarters. The

emphasis, however, was on improving telecommunication services in urban areas. However, one of the objectives of the National Telecom Policy was to achieve universal service covering all villages. Out of the 5,76,490 villages, nearly 1.4 lakh villages had been covered telephone services. It set the target of covering all villages by 1997. Every year DoT connected a few villages using the wireless Multi-Access Rural Radio (MARR) technology, which required high maintenance, seldom given, and so a high proportion of connections did not work.

Policy Emphasis on Rural Telecommunications

Focus of government policy on rural roll out of telephone lines started largely in the Eight Five Year Plan (1992-1007). The plan aimed at providing 0.309 lakh Village Public Telephones (VPT) by 1997, covering almost half of the total number of villages. However, under this scheme a large section of rural population was not able to avail the service primarily because of the rigid social interaction patterns in the Indian villages which did not allow the socially backward castes to use the telephones generally kept in the house of the village head, who belonged to the socially higher caste. To overcome this obstacle, DoT started keeping phones in shops where it could be accessed relatively easily. Further, few village telephones has long distance connectivity which meant low potential for revenue generation. Also the village administrators did not pay the bills and the maintenance of the telephones had technological and logistical issues.

The targets set by the National Telecom Policy, as regards rural telecommunications were not fulfilled (Table 3.1). DoT which was to connect all villages did not fulfil its targets and so did the private wireline operators, who were required to install a certain proportion of their connections in villages in their licensing agreement. DoT continued to connect villages with atleast one VPT, with the assumption that the private sector would contribute significantly. Telephone coverage had been provided to only 3.1 lakh villages by 1999⁶⁹. With the private operators in serious financial

⁶⁹ DoT., (1999).

problems, the government announced the New Telecom Policy in 1999. The New Telecom Policy aimed at providing a balance between the provisions of universal services to all uncovered areas, including rural areas and the provisions of high level of service which would meet the needs of the economy. In light of the above objective, the New Telecom Policy set the objective of encouraging development of rural telecommunication, making it more affordable by a suitable tariff structure and making rural communication mandatory for all service providers. It also specifies increasing teledensity in rural areas from 0.4 to 4 by end of 2010. It also set the target of achieving telephone coverage in all villages and to provide media to all exchanges by 2002.

Table 3.1: Year wise VPT Coverage

Status as on 31 st March	Total VPTs (000s)	Percentage of Villages Covered	VPTs Added Over Previous Year (000s)
1995	172.5	28.4	
1996	204.0	33.6	31.5
1997	260.7	42.9	56.7
1998	303.6	49.9	42.9
1999	340.6	56	37.1
2001	408.9	67.3	68.2
2002	468.9	77.1	59.9
2003	514.2	84.6	45.4
2004	522.3	85.9	8.1
2005	539.4	88.7	17.0

Source: Jain, R. (2005): "Accelerating Indian Rural Telecom Services: Policy and Regulatory Approaches", IIM, Ahmedabad.

There were telephones in 410,757 villages on July 31, 2001. Out of the 374,617 telephones on April 1, 2000, 211,313 used MARR technology, which DoT had stopped using since 1998⁷⁰. During this period, the ability of the incumbent to cross-subsidize rural connections declined due to its falling profits, as the revenues it earned from its monopoly on long-distance and international calls and the interconnection charges it levied on private operators changed significantly after the New Telecom Policy. The attempts by TRAI to prepare the incumbent for it by reducing cross-subsidies and increasing rentals were stalled in the political sphere. There was thus the

⁷⁰ Desai (2006).

need to find a new source to finance the cross-subsidies. The solution was given in the New Telecom Policy in the form of creation of levying proportional charge on the revenues of all licensed service providers.

Universal Service Obligation

Universal service refers to the idea that an infrastructural public utility, such as telephones, should be available to everyone. Rural telephony is subsidized in most developing countries as telephone penetration is lower in rural areas than in urban areas. Also political factors or balanced regional development goals have induced governments to transfer resources to rural constituents. The costs of services in rural areas are high because of the lower population density than urban areas and greater average distance, not only between subscribers but also local telephone switches. In India, the first official universal service provision was included in the National Telecom Policy of 1994. This policy was further strengthened in the New Telecom Policy of 1999.

Under the New Telecom Policy, the government aimed at achieving:

- Provide voice and low speed data service to the balance 2.9 lakh uncovered villages in the country by the year 2002.
- Achieve Internet access to all district head quarters by the year 2000.
- Achieve telephone on demand in urban and rural areas by 2002⁷¹.

The resources for meeting the Universal Service Obligation (USO) were to be raised through a universal access levy, which would be a percentage of the revenue earned by all the operators under various licences. The percentage of revenue share towards universal access levy would be decided in consultation with TRAI. The implementation of the USO obligation for rural areas was to be undertaken by all

⁷¹ DoT., (1999).

fixed service providers who shall be reimbursed from the funds from the universal access levy.

TRAI recommended the formation of a Universal Service Fund (USF), which was to be looked after by an administrator attached to it. The financing of USF was to be from a 5 percent levy on revenues of all operators. The subsidy, which would be given to the operators, was to cover the losses on capital as well as on the operational costs of rural connections and would also pay for the replacement of non-functional facilities. Following priorities were to be followed:

- A telephone in every village.
- Telephones with trunk call facility to be increased and a second public telephone in the 75,000 villages with more than 2,000 residents.
- One fifth of the VPTs to be upgraded into Public Telecom and Info Centres (PTICs).
- Installation of 9.6 kbps and 28.8 kbps connections for Internet and government Wide Area Networks (WANs). High speed 128 kbps connectivity to PCITs in every SDCA – 5,400 in total⁷².

Government set up the USF within DoT by amending the Indian Telegraph Act of 1985, in 2003. Under the Indian Telegraph Amendment Act of 2003, which became operational on April 1, 2004, the USF became a non-lapsable fund. Earlier the expenditure on rural connections relied entirely on the incumbent, now it would now have a steady source of finance. Also, the providers of connections and services would be chosen by an auction to minimize costs. The fees levied are shown in Table 3.2. For determination of subsidy, first costs and revenues were to be estimated for generating benchmark estimates of the likely loss. Then these estimates were to be used as caps in an auction where the bidders were asked to quote their requisite

⁷² TRAI, (2000b).

subsidy to install telephones or offer telephones. For the existing facilities, the subsidy would cover the excess of operating costs, while for the new facilities the excess of full costs over revenues. Operators in the circle where the project was located were given first preference in an auction and then to other operators if the bids of the former failed to satisfy the criterion. The agreements were to be for seven to nine years, to be reviewed after three years. The payments were to be made every quarter subject to the rollout conditions and deductions on account of faulty service. There was no restriction on technology. Table 3.3 illustrates the disbursement of USF. Over the years only one-third of the funds have been distributed. This has been mainly been to replace the old equipments and for installation of VPTs. However, the distribution of funds to operators willing to provide services in rural areas has been dismal. Since, USF is provided on the basis of actual physical performance i.e. reimbursements are made on completion of installation and verification of physical records, it can be safely argued that the roll out of telephones in rural areas has been insignificant.

Table 3.2: Revenue Share and USO, 2004

	Revenue Share	To USF	To Govt. Revenues
	percent of Adjusted Gross Revenue		
Wireline			
A Circles	10	5	5
B Circles	8	5	3
C Circles	5-6	5	0-1
Cellular			
Metros	10	5	5
A Circles	10	5	5
B Circles	8	5	3
C Circles	5-6	5	0-1
Domestic Long Distance	15	5	10
International	15	5	10

Source: Desai, A. V. (2006): "India's Telecommunications Industry".

USF gave out contracts for setting up rural community telephones in 48, 310 villages, with inhabitants over 2000, located in 281 Secondary Switching Areas (SSAs) in September 2004 relating to installation of VPTs and the replacement of MARR based VPTs. Out of these 184 went to BSNL and 97 to Reliance. In March 2005, it awarded contracts for installing 8 million individual rural telephones. BSNL was the sole

bidder in 62 SSAs and won another 171 SSAs in 19 states. Reliance won 61 SSAs in 15 states and TATA Teleservices 42 SSAs in 9 states⁷³. There was thus, failure to create competition for the rural public services. This was largely due to the fact that the calculations were based on cost estimates provided by BSNL which are aggregated in a manner where it becomes difficult to separate costs for different operations mainly the incremental cost of public telephones. Further, BSNL received nearly all of the Access Deficit Charge (ADC) cross-subsidies (to be discussed in detail below). Consequently, the incumbent has potential gains from manipulating cost information, because these data not only determine the benchmark subsidy for public phones but also the magnitude of deficit for all local access service. Also, the practice of opening the bids to operators already providing service in the rural area precluded firms and did not encourage either entry or innovation in rural services.

Table 3.3: Universal Service Obligation Fund Position

Financial Year	Opening Balance	Funds collected as USL	Funds allocated	Funds disbursed	Balance at the end of the Year	% of USF disbursed
2002-03	0	1653.61	300	300	1353.61	18.14
2003-04	1353.61	2143.22	200	200	3296.83	9.33
2004-05	3296.83	3457.73	1314.59	1314.59	5439.97	38.02
2005-06	5439.97	3533.29	1766.85	1766.85	7206.41	50.01
2006-07	7206.41	4211.13	1500	1500	9917.54	35.62
2007-08 ^a	9917.54	5405.46	1290	1290	14033	23.86
Total		26164	8571.44	8242.24		31.50

Note (a): Tentative figure for USL Collection.

Source: DoT, Office of the Administrator, USF.

Access Deficit Charges

The other source for generating revenues for financing building of infrastructure was the Access Deficit Charge (ADC). ADCs are essentially the fees paid by private entrants to the incumbent presuming that the basic service providers face unprofitable social service obligations and should therefore be compensated by private entrants

⁷³ Desai (2006).

who are free to seek out a profitable subscriber base. ADCs were incorporated into the interconnection charges and it was paid directly to the state-owned incumbent (BSNL). TRAI, in one of its Consultation Papers⁷⁴ imposed an ADC of Rs 130 billion on the telecommunications industry i.e. 30 percent of the telecommunications industry's revenue. It was to be a tax on every international and national long-distance call, which would increase with the distance of the call. Recently TRAI has reduced its estimate by more than half i.e. from RS 130 billion to Rs 53.4 billion. The calculations were based on the accounting data from BSNL.

ADCs were imposed on some calls. Table 3.4 shows the original ADCs (top panel) and the charges that were adopted in 2005 (bottom panel). The old system imposed higher charges on long-distance calls over 50 km. The later system had lower charges for international calling but increased charges of incoming calls. No ADCs have been imposed on local calls or long-distance calls under 50 km that originate and terminate on fixed networks and on wireless networks. In the later system all calls between fixed and wireless networks paid Rs 0.30 per minute while earlier they used to pay Rs 0.80. The incoming foreign charge was cut from Rs 4.25 to Rs 3.25, with a further cut to Rs. 2.50 for outgoing calls. The net impact of ADC was that the Indian callers to international numbers and foreigners subsidized the state-owned incumbent.

The ADCs imposed by TRAI were inefficient. As the price elasticity of demand is much greater for using services than for access to it, taxing usage to finance usage substantially distorts the former to obtain little gains for the latter. As per the provisions of ADCs, an individual has the financial incentive to acquire access service using the same technology as the parties being called. Difference in prices according to distance creates another distortion. A call over a distance of over 225 km between adjacent states was taxed nearly 3 times as much as a call of the same distance within a state. In effect ADCs can be perceived to be the subsidization of the incumbent by private enterprises. However, it should be kept in mind that subsidization for rural

⁷⁴ TRAI. (2003a).

connections is necessary as the costs involved are huge and the revenues that can be generated are far less.

ADC charges were opposed by the cellular operators⁷⁵. The international long distance carrier, VSNL, also objected to ADC. It argued that ADC had encouraged a grey market in international calls that were able to avoid ADCs. TRAI had to review the existing ADC regime as operationally it had become difficult to manage the charges due to the complicated mechanism of per minute schedule. Also, the lack of accounting separation in BSNL, the data supplied by operators created implementation problems.

TRAI proposed to shift to the revenue sharing mechanism for implementing the ADCs. This was opposed by BSNL, who had substantially contributed towards rural telephony. Meanwhile, TRAI reduced the ADC in January 2005, owing to the grater minutes of telephone usage. It became evident that TRAI was favouring BSNL. On its part, TRAI argued that ADC was needed due to the requirements of the rural operations of BSNL. Reduction in ADC for long distance calls benefited VSNL and the GSM cellular operators but the latter wished for more. COAI suggested more drastic reductions in ADC.

TRAI notification in 2006 reduced the ADC amount and accepted the revenue share principal⁷⁶. ADC was pegged at 1.5 percent of the annual gross revenue of telecom companies. There was to be no ADC on national long distance calls. ADC on outgoing international calls was reduced from Rs 2.50 to Rs 0.80 while ADC on incoming calls was reduced from Rs 3.25 to Rs 1.60. ADC benefits for fixed wireless services were removed. The new regime reduced the arbitrage opportunity for the large integrated players and removed the benefits enjoyed by CDMA operators. It resulted in declining tariffs and price wars in the cellular markets that gave a boost to the growth in teledensity. In the last amendment to the rules governing ADC, the

⁷⁵ For detail analysis see Mukherji (2008).

⁷⁶ TRAI., (2006).

service providers were required to pay 0.75 percent of their Adjusted Gross Revenue (AGR) and the international long distance service providers were required to pay Re 1 per minute on international incoming calls to BSNL.

Table 3.4: Access Deficit Charges (Rs per minute)

Access Deficit Charges	Local Calls	Intracircle Calls		Intercircle Calls			International Long Distance	
		0 – 50 km	> 50 km	0 – 50 km	50 – 200 km	> 200 km		
Before January 2005								
Fixed – Fixed	0	0	0.3	0.3	0.5	0.8		
Fixed – WLL	0.3	0.3	0.3	0.3	0.5	0.8		
Fixed – Cellular	0.3	0.3	0.3	0.3	0.5	0.8	4.25	
WLL – Fixed	0.3	0.3	0.3	0.3	0.5	0.8		
WLL – WLL	0	0	0	0.3	0.5	0.8		
WLL – Cellular	0	0	0	0.3	0.5	0.8	4.25	
Cellular – Fixed	0.3	0.3	0.3	0.3	0.5	0.8		
Cellular – WLL	0	0	0	0.3	0.5	0.8		
Cellular – Cellular	0	0	0	0.3	0.5	0.8	4.25	
Access Deficit Charges	Local Calls	Intracircle Calls		Intercircle Calls		International Long Distance		
		0 – 50 km	> 50 km	All Distance		Outgoing	Incoming	
After January 2005								
Fixed – Fixed	0	0	0.3	0.3				
Fixed – WLL	0.3	0.3	0.3	0.3				
Fixed – Cellular	0.3	0.3	0.3	0.3		2.50	3.25	
WLL – Fixed	0.3	0.3	0.3	0.3				
WLL – WLL	0	0	0	0.3				
WLL – Cellular	0	0	0	0.3		2.50	3.25	
Cellular – Fixed	0.3	0.3	0.3	0.3				
Cellular – WLL	0	0	0	0.3				
Cellular – Cellular	0	0	0	0.3		2.50	3.25	

Source: Noll, R. G., and S. J. Wallsten (2006): "Universal Telecommunications Service in India", India Policy Forum.

TRAI had intended to impose ADC fees for five years. In March 2008, TRAI proposed the removal of ADC. While acknowledging the effective need to promote rural telecommunications, it opined that benefits of abolition of ADC should go towards improving telecommunications services in rural areas. ADC as a percentage of AGR was phased out from April 1, 2008. The component on international incoming calls was payable at a reduced rate of Rs 0.50 per minute from April 1, 2008

to August 30, 2008 and this would also be phased out from October 1, 2008⁷⁷. Thus, the ADC charges on operators have been removed. ADC was introduced to help the incumbent in transition from monopoly to competition and rebalance tariff. However, ADC puts unfair burden on the new entrants and thus further support to the rural commitments of the incumbent should be considered from the USF. Support to the incumbent is necessary for their rural wireline operations as about 99.87 percent of lines belong to BSNL. To ensure that the wireline connections are supported and its maintenance done, BSNL was given a subsidy of Rs 2,000 crore per annum from the USF for sustaining wirelines installed before April 1, 2002⁷⁸.

Extent of Rural-Urban Divide

Although the Indian telecommunications services have seen very rapid growth rates, both in fixed and mobile services, the growth has largely been in the urban areas. As of 2009, while urban teledensity has reached 88.84 percent rural teledensity is 15.11. Even though the target achieved is higher than the target set in the New Telecom Policy i.e. 4, the gap has progressively increased. This is evident from Figure 3.1, which shows the teledensity in rural and urban areas. A yet another dimension of the rural-urban divide is the variations in teledensity across different circles. Table 3.5 shows the urban divide among circles. It is evident from the table that the poorer states fare badly on the rural teledensity measure.

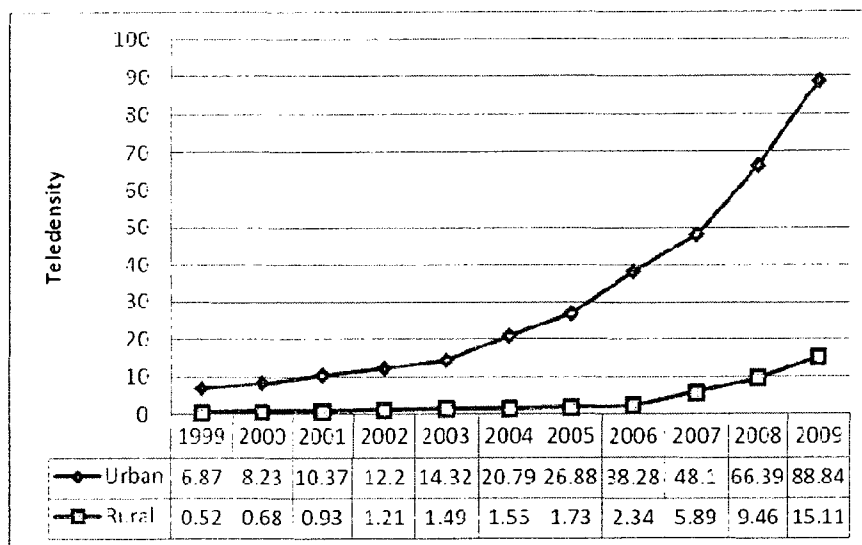
The provision of VPTs has also improved. As on March 31, 2009, there were 1235.13 lakh phones in rural areas. Out of the 66,822 uncovered villages 57181 VPTs had been provided till March 2009. As on March 31, 2009, about 5,58,007 villages i.e. 94% of the Census 2001 inhabited revenue villages were covered with (VPTs). Figure 2.1 shows the status of VPTs. The private operators share in these VPTs is very negligible and almost the entire VPTs have been installed by BSNL. The total number

⁷⁷ TRAI., (2008a).

⁷⁸ *Ibid.*

of VPTs of BSNL was recorded at 5,19,616 in March 2008 and the number of VPTs of private operators stood at 39,887 in March 2008. In percentage terms, BSNL's contribution was 94% and private Basic Service Operator's (BSO) contribution was 6%.

Figure 1.1: Teledensity in India



Source: DoT, Annual Report, 2008-09.

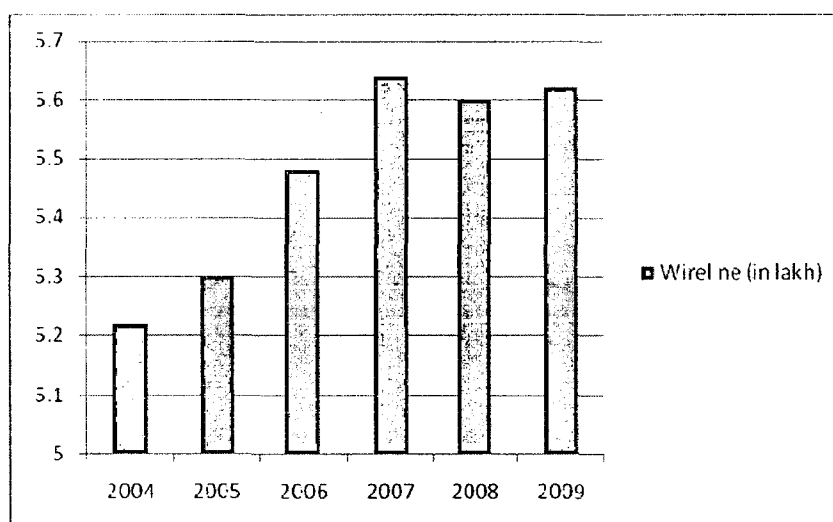
Table 3.5: Teledensity within Telecom Circles as on March 31, 2009

Circles/States	Tele-Density			
	Overall	Urban	Rural	Urban - Rural
ANDAMAN & NICOBAR	21.24	28.89	16.57	12.32
ANDHRA PRADESH	39.59	103.38	15.22	88.16
ASSAM	20.65	86.98	9.36	77.62
BIHAR	22.18	133.00	9.17	123.83
CHHATTISGARH	5.15	16.69	1.81	14.88
GUJARAT	45.16	75.43	25.21	50.22
HARYANA	43.75	75.98	28.10	47.88
HIMACHAL PRADESH	55.50	179.81	40.47	139.34
JAMMU & KASHMIR	32.76	77.42	16.72	60.70
JHARKHAND	4.11	13.02	1.44	11.58
KARNATAKA	45.21	98.73	14.36	84.37
KERALA	58.48	125.35	35.43	89.92

MADHYA PRADESH	30.08	80.36	11.07	69.29
MAHARASHTRA	37.90	69.67	21.70	47.97
NORTH-EAST- I	44.49	139.10	14.67	124.43
NORTH-EAST- II	9.21	27.36	3.69	23.67
ORISSA	23.30	78.09	12.55	65.54
PUNJAB	58.25	95.85	33.11	62.74
RAJASTHAN	37.15	102.56	16.71	85.85
TAMIL NADU	50.46	79.48	25.62	53.86
UTTARANCHAL	11.59	25.97	6.04	19.93
UTTAR PRADESH	24.91	77.76	10.24	67.52
WEST BENGAL	22.51	77.86	13.50	64.36
KOLKATTA	89.68	-	-	-
CHENNAI	127.38	-	-	-
DELHI	140.18	-	-	-
MUMBAI	110.52	-	-	-
ALL- INDIA	36.98	88.84	15.11	73.73

Source: DoT, Annual Report, 2008-09.

Figure 3.2: Status of VPTs, 2004-09



Source: TRAI, Annual Report, 2007-08 and DoT, Annual Report, 2008-09.

DoT has gone into an agreement with BSNL to replace the 1,85,121 number of VPTs, with reliable technologies, which earlier used to work on MARR technology and were installed before April 1, 2002. These included 47075 MARR VPTs already replaced before May 30, 2003 (MARR-B) and 138046 MARR VPTs to be replaced from July 1, 2003 onwards (MARR-A). A total number of 1,83,865 MARR VPTs have been

replaced as on March 31, 2009. Agreements were signed on September 30, 2004 with BSNL and Reliance for providing 40,705 Rural Community Phones (RCPs) in villages with population more than 2000 and not having PCO facility. Out of these, 40689 RCPs have been provided till March 2009. While BSNL has achieved its target of installing 21958 RCPs, Reliance achievement is 18,731, 16 short of its target of 18,747⁷⁹.

Under the provision of USF, infrastructural sites (towers) were set up for provision of mobile services in the specified rural and remote areas, where there is no existing fixed wireless or mobile coverage. As on March 31, 2009, 4755 towers have been set up under this scheme⁸⁰. With the provision of wireless services in rural areas, the number of wireline subscribers has decreased (Table 3.6). While there has been a steady increase in the absolute number of wireless subscribers, the numbers are still relatively small. However, if one looks at the percentage of rural wireless subscribers, one can see that there has been a small increase in the percentage of wireless subscribers.

Table 3.6: Wireline and Wireless Subscribers (in lakh)

Year	Wireline Subscribers	Rural Wireline Subscribers	Wireless Subscribers	Rural Wireless Subscribers
March 07	40.75	12.56 (30.82)	165.11	33.14 (20.07)
June 07	40.09	12.27 (30.61)	184.92	37.40 (20.22)
September 07	39.58	11.99 (30.29)	209.08	43.98 (21.04)
December 07	39.25	11.75 (29.94)	233.62	52.52 (22.48)
March 08	36.42	11.64 (31.96)	261.07	62.28 (23.86)

Note: Figures in parentheses denote the percentage values.

Source: TRAI, Annual Report, 2007-08.

Even though the absolute performance of providing telecommunications services has substantially improved, the provisions of rural telecommunications in India are not adequate. Promotion of rural telephony and accessibility of telephones to remote areas should be an important thrust area for DoT. With the recent provision of wireless

⁷⁹ DoT, Annual Report, 2008-09.

⁸⁰ *Ibid.*

telephony in rural areas the teledensity in rural Indian has improved. It is well recognized that a well spread out provision of telecom services in rural areas enhances the ability of people to participate in the market economy, which, in turn, improves their productivity and contributes to their earnings.

Chapter 5

Conclusion

The economic boom of the late 1990s included huge investments in the telecommunications industry of US and related sectors. It was followed by a downturn, which was quite severe and not only reduced wealth by millions of dollars but also cost many thousands of jobs and resulted in some of the biggest bankruptcies in the history of telecommunications. Two major antitrust suits – *United States vs Western Electric*, filed in 1949 and *United States vs AT&T*, filed in 1974 – went a long way in determining the approach of policymakers and regulators in introducing competition in telecommunications industry. The latter suit resulted in the divestiture of AT&T into seven regional Bells (RBOCs). This ushered in an era of competition in the long-distance telecommunications market in US, while the local markets remained a natural monopoly largely due to high last-mile costs. Divestiture had succeeded in opening the long-distance market to competition, with long-distance prices falling dramatically. With the long-distance market sufficiently competitive, the policy makers turned their attention towards the local telecommunications market.

In order to facilitate competition in the local market, the US Congress passed the Telecommunications Act of 1996. In doing so it replaced the regulatory framework of the natural monopoly era with a deregulatory approach that promised new consumer benefits through competitive forces in the local as well as the long-distance market. It gave FCC considerable discretion in implementing the provisions of the Act and to decide the best way to introduce competition in telecommunications market. In doing so, the Act left the door open for parties – the entrants and the incumbents – to challenge the rulings of FCC. Every advantage granted by FCC to one part of the industry was litigated by the other. Further, many successful judicial challenges to FCC's interpretation of the Act created an ambiguity in the market. Delays in the implementation of the rules often helped the incumbents who also had a steady cash flow to fund their business. On the other hand, the new entrants only had a small window of opportunity to set up and operationalize their business before they used up

their invested capital. And when the market peaked during end of 1999 and beginning of 2000, there was no going back on the investment activities.

However, it is not the case that the telecommunications crash in US was solely due to the changes in the regulatory environment brought about by the Telecommunications Act of 1996. Technological advances in the field of telecommunications go a long way in explaining the behaviour of the US telecommunications industry at the turn of the century. Technological advances in the field of fibre optics dramatically increased the data transfer capacity of wires. An important characteristic feature of US telecommunications is that data transfer accounts for more than two-third of the traffic on the network. With the dot-com boom going on, Internet was perceived to be the next 'big thing' in US. Further, with the advent of new applications like video streaming, it was perceived that there would be a huge demand for Internet services. To aggravate the problem; some firms (like WorldCom), falsely predicted that Internet traffic would double every 100 days. This led to a race among firms to expand their infrastructure, especially laying down fibre optical lines.

A propitious interaction between technological and regulatory changes combined with the over optimistic projection of demand for bandwidth led to massive increase in investment in the US telecommunications sector. Also, the dot-com euphoria as well as the economic expansion at the time eased the access to finance. Investors gave money to corporate executives who were more than willing to cash in on the profits that the Internet age promised to bring. These factors led to a boom and bust cycle in US telecommunications. The crash had an obvious outcome – lot of companies folded up. Further, the bigger companies not only acquired the financially weaker companies but they also merged among themselves to consolidate their interests. The overall cost of the crash in the US telecommunications industry was a staggering \$ 1.4 trillion. More than \$ 500 billion was lost because of overinvestment and ill-advised mergers. The network construction boom led to a spending bubble that cost \$ 220 billion. The massive investment in the telecommunications industry led to the generation of excess

capacity. Finally, when the steam went out of the 'telecom bubble', the industry was witness to a spectacular crash.

Unlike the US telecommunications industry, the Indian telecommunications industry was in placid backwaters for the most part of its evolution process. It was a government monopoly and was designed to protect its monopoly interests. Investment in telecommunications came under the Five Year Plans, which gave low priority to it, classifying it as elitist. As a consequence, there were long waiting lists for telephones. However, in 1980s, when it was deemed possible to introduce competition in network industries, like telecommunications and entry of private players was welcomed in most countries, reforms were also introduced in Indian telecommunications. In 1986, DoT was formed as an operational arm of the communications ministry to look after the functioning of telecommunication utilities.

The long waiting list and the investments required to keep up with the demand of telephones encouraged the government to encourage reforms in telecommunications. However, this came under strict opposition from DoT. Initially, private players were introduced in the equipment manufacturing segment. However, such a strategy did not improve the roll-out of telephones. Consequently, post the payments crisis, private players were allowed entry in 1992, when bids were invited for metro cellular licenses. The goal of the policymakers was, however, not to allow competition in basic services but in value added services so as to earn additional profits. The legal imbroglio involved in the licensing process meant that services could only be started in 1995. The changed demand conditions combined with the licensing and tariff structure meant that the call rates of cellular operators would be a distinct multiple of wireline charges. Thus, mobile phones entered in India as a luxury. Long-distance calls were still a government monopoly.

India had introduced competition in the local market and that too at a very small scale. In order to take forward the process of reforms, the National Telecom Policy of 1994

was announced. It laid down specific guidelines for granting licenses and introduced the concept of joint venture equity partnership between the domestic firms and foreign firms. The licensing terms and the interconnection charges, which were heavily in favour of the incumbent i.e. DoT, as well as the delay in final granting of licenses resulted in unviability of operations for both the cellular as well as the wireline operators.

With the introduction of competition and entry of number of private players there was a need for a regulator. India set up its regulator, TRAI, in 1997. However, the provisions of the regulator were so loosely defined that the moment it tried to create a level playing field in the telecommunications utilities, its actions and authority were challenged by DoT. The adverse judgement TRAI received on its interconnection, licensing and rental policy severely damaged TRAI's ability to protect the entrants from the monopolistic actions of the incumbent. It took further legislation to restore TRAI's powers.

With most of the private players in financial trouble and the DoT threatening to encash the bank guarantees, the government announced the New Telecom Policy of 1999. The government also set up an appellate authority TDSAT. The provisions of the New Telecom Policy changed the licensing conditions and the interconnection and tariff provisions. Private operators were not only allowed to build their own infrastructure within their circle boundaries but they were also no longer required to route their calls through DoT networks. DoT was corporatized and BSLN was made its operational arm and both BSNL and MTNL were allowed to enter the mobile business. The price cuts introduced by them intensified the price competition among cellular operators. Further, with the government monopoly in national and international traffic being abolished by 2002, the call charges fell.

The provisions of the New Telecom Policy of 1999 breathed new life in the functioning of the private operators. Cellular operations had become profitable.

However, the intense price competition implied that the large operators, who could realize their network economies and had command over finance, were able to sustain in that environment. The smaller operators were eliminated. There was, thus, consolidation and increased concentration, with a few private operators owning the bulk of the licenses.

One of the requirements of the New Telecom Policy was foreign equity partnership with experienced telecommunications' utilities firms with a maximum equity for the foreign partner being 49 percent. The rationale given behind this was that the technical expertise of foreign firms will help the private Indian players who did not have the requisite technical expertise. As US was one of the few nations who had liberalized its telecommunications network and allowed its firms to invest abroad, the number of US forms getting into joint ventures was high. However, due to the initial financial failures of many companies, a large proportion of foreign equity players sold their stakes. Most of these were bought by Indian telecommunications companies in collaboration with their foreign partners. As the government financial institutions had also invested in the ventures of the private telecommunication players, there was involvement of government institutions in the fortunes and developments of the telecommunications industry in India.

The governments increased the FDI limit in telecommunications to 74 percent in 2005. This was done, not only to protect the interests of GSM operators from CDMA operators, who had control over large quantities of own capital, but also to provide another way of increasing FDI in Indian industries. Over the years there has been a huge inflow of FDI in Indian telecommunications. In 2005, India moved to a universal licensing regime, where the barriers to national and international long distance services were removed and the operators were given pan-India licenses.

India's teledensity in 1948 was 0.02 percent, while the same in 2000 and 2009 was 2.85 and 36.98 respectively, much higher than the target of 15, set by the New

Telecom Policy and to be achieved by 2010. Over the years India has emerged as one of the fastest growing telecommunications network in the world. However, the growth has largely been driven by the wireless segment which has come to be dominated by private players. The public provisions of telecommunications have largely been concentrated in the wireline segment. This structure can be attributed to the historical way in which reforms were implemented in India. While the government utilities – DoT and later BSNL and MTNL dominated the wireline segment, the private players were encouraged to provide wireless services. It was only in 1999 and 2000 that MTNL and BSNL were allowed to start their cellular services.

The contour of reforms in the Indian telecommunications industry was essentially one where the new players were allowed to provide their services in an entirely new segment i.e. the wireless services. Most of the industrial countries set up regulators and privatized their state-owned incumbent before they introduced competition, this was not the path followed in India. In the US telecommunications industry, antitrust laws were used to control the monopolizing behaviour of the incumbent (AT&T). This led to increase in competition in the long-distance market. It was only later that competition was introduced in the local telecommunications market. However, in the Indian telecommunications industry, reforms were introduced not only because the state-owned incumbent was inefficient (the waiting list of telephones failed to shorten) but also because the conditionalities that came with the loan requirements of IMF-World Bank, due to the payments crisis, required India to open up different sectors of its economy, including telecommunications.

The introduction of private players in Indian telecommunications was not seen as introducing competition in basic services. Rather services from private players were seen as supplementing basic services by providing mobile services for the elite population of India. This did not come in conflict with the incumbent's basic services provision. Further licenses that were issued to the private players limited their operations to different circles. The license fee for service provisions of private players were initially sold for a high fee. Also, there was overbidding by the winners of

licenses. The revenue earned from the issue of licenses was to be used for the incumbent's target of providing universal service.

This is in sharp contrast to the reforms process in the US telecommunications industry. While the reforms in US was more in terms of deregulating the local market, which was considered to be a natural monopoly, in India, the reforms were largely used to supplement the finances of the state-owned incumbents. Also, the long-distance market and the provisions of basic services were kept as a state monopoly. The introduction of private players in India was in a segment that did not come in direct conflict with the service provisions of the incumbent. It allowed the political brass to exhibit the success of the reforms in the telecommunications sector. US, like other industrial countries had a well functioning regulator, which set down rules to increase competition as per the legislative guidelines (Telecommunications Act of 1996). On the other hand, not only was there no presence of a regulator in Indian telecommunications industry, but also the terms of licensing, rentals and tariffs were arbitrarily set by the incumbent itself, which heavily favoured the operations of the incumbent and could have helped it in continuing to exert its monopoly power.

The formation of TRAI in 1997, as a regulator in the Indian telecommunications industry, was perceived to be beneficial in enhancing competition in the telecommunications industry. However, 1997-2000 was a difficult phase in the functioning of TRAI, as the loosely formulated legislative design deprived it from acting efficiently as an arbitrator between the incumbent and the entrants. It got caught up in different litigations when it tried to create a level playing field. The Court's judgements on different litigation severely weakened and undermined TRAI's authority and it took further legislation to restore its powers. On the other hand, there was already in place a regulator in the US telecommunications industry, FCC, when competition was introduced in both, the long-distance as well as the local market. Even though FCC had greater authority than TRAI in determining the contours of deregulation and hence enhance competition in the local market by determining the rules of interconnection and pricing, it also got entangled in legal challenges by both

the parties, i.e. the incumbents as well as the entrants, whenever its decision was perceived as favouring the other party. This created an ambiguity in the US telecommunications market.

The inability of Indian private operators to pay their license fees meant that DoT had threatened to encash the bank guarantees. Since many government financial institutions had provided the guarantees in the ventures of the private players and over time the private players had understood the methods to manipulate the political brass, the government intervened in the form of the New Telecom Policy of 1999. The New Telecom Policy not only breathed fresh life into TRAI but also the changes in policy, like the shift to revenue sharing, increased the profitability of the cellular operators. However, the intense price competition meant that only those private players who could exploit their network economies and had easy access to finance would be able to survive, leading to consolidation in the market. The big industrial conglomerates thus formed continued to grow remarkably in the wireless segment.

One of the important causes of the telecommunications crash in US was the belief that the demand for Internet would be growing at very high rates and so the companies set out to invest in not only laying down fibre optics but also in their manufacturing. These investments were financed mainly by the money the dot-com boom had brought. However, once it was realized that the growth in demand for Internet bandwidth would not be the same and that most of the companies had overinvested, leading to generation of excess capacity, the market crashed. A lot of players sold out and there was a wave of mergers and acquisition where the bigger companies sought to protect their interests, leading to an oligopolistic market structure.

The market structure that has emerged in the Indian telecommunications industry is essentially oligopolistic. However, there are certain differences in the structure of reforms in the Indian telecommunications industry that has not seen a market crash even when the finances of most of the private players were in disarray. Unlike the US

telecommunications sector, where data transfer accounts for more than two-thirds of the network traffic, voice calls are the main component of data transfer in the Indian telecommunication industry. Even though Internet services have grown in recent years, the penetration of broadband facilities has been modest. Further, the broadband facilities have been dominated by the public sector units (BSNL and MTNL). It is very recent that private players were allowed to provide Internet facilities to consumers. The growth of the private players has been in the wireless segment, which does not involve high investments in infrastructure. Also, with wireless services introduced in semi-urban and rural areas and business innovations like pre-paid, lifetime validity of connections has meant that in these areas the growth of wireless services has outstripped the growth of wireline services.

Segregation of market segments of the incumbent and the private players is not the only feature of the reform process. The reforms in Indian telecommunications were designed to build an oligopolistic form of market structure. The number of players who were issued licenses in different circles was kept small so as not to challenge the monopoly of the incumbent. Thus, while the incumbent was initially limited to the wireline segment, the private players were more concentrated in the wireless segment (even though they had licenses to provide wireline services, the business was not perceived to be profitable). As mentioned earlier, meaningful competition arrived only when BSNL and MTNL were allowed to enter the mobile business, leading to intense price competitions. Also, movement to the revenue share regime combined with the increasing price competition in the wireless segments meant that the smaller players' were not able to compete with the bigger service providers and hence most of them sold out.

The introduction of universal licensing regime in Indian telecommunications has seen entry of new players in the market. Even then the market share in both, the GSM and the CDMA markets has few players who control a bulk of the market. The service providers have employed different business innovations to keep the loyalty of their customers. Calls on same network are charged less and it pays to the customers if his

/her calling destinations are on the same network. This is something that TRAI has to counter so as to make the market more competitive. The number portability system is a good initiative in this regard.

The different phases in which reforms were introduced in the Indian telecommunications industry has allowed the incumbent to gradually restructure itself. Its entrance in the wireless service has led to phenomenal growth in the segment. However, most of this growth has been in the urban areas. One of the reasons of this urban-rural divide can be traced to the evolution of the reforms process in Indian telecommunications. Telephone utilities were considered to be elitist and one of the reasons for the migration of people to urban areas. The main needs of the people were considered to be food and shelter. Even though this is true at present, the approach of the policymakers did not give priority to investments telecommunications.

The cellular services were first introduced in the metro areas and then extended to different circles. The licensing conditions required the private operators to connect the district headquarters. The provision of cellular services in rural areas could only start in 2007. Ever since the introduction of cellular services in rural areas, its growth has been phenomenal. The growth of rural wireless subscriber has been larger than the rural wireline subscriber growth. With the technological advances in the wireless segments the cost of providing telecommunication services in rural areas has declined substantially. Consequently, the demand for such services in rural areas has also been high.

However, historically the rural areas were deprived of telecommunication services. The sparsely dense rural markets with low income levels of the population, combined with the high cost of installation in rural areas meant that telephone services were provided only by the incumbent. The incumbent on its part used to charge the private operators in order to generate resources for providing telephones in rural areas. Provision of rural telephony was not high on the agenda of the policymakers. It was

only in the New Telecom Policy of 1999 that providing rural areas with telephones was given importance. The creation of USF was a welcome change in this regard. Along with USF, the collection of ADCs were the two ways in which the incumbent generated revenue to fulfil its unprofitable social service obligations.

Even though the targets set for rural areas in terms of teledensity has been achieved and connectivity in villages is better, there is still a lot of scope for further development. BSNL continues to be the dominant provider of wireline telephones with very little contribution from the private players. The collection of ADCs has been abolished, telecommunication service providers still contribute to the USF. While USF is a superior mechanism than the earlier one when providing rural connections depended on the whims of the incumbent, the competition for USF is absent. The number of bidders, in the auctions for USF, is extremely small with BSNL being the only bidder in most cases. This is partly due to the fact that the bidding patterns allows less number of operators both at the circle level and at the national level and that the oligopolistic structure in the telecommunications industry has not resulted in many players. The USF is accumulated in the Consolidated Fund of India. The non-disbursal of USF has resulted in the Finance Ministry (who manages the fund) to deny requests for additional funding over the previous benchmark spending levels. The disbursal of USF should focus on higher visibility by setting up total coverage of areas where the rural teledensity is high within a time frame so as to make a case for higher contributions. Removing impediments in the growth of the telecommunications sector would also lead to higher contribution in the fund. With the rural and semi-urban areas going to be the driving force in the growth of the telecommunications industry, policy initiatives in this regard need to be taken.

With the practice of collecting ADC has been done away with, alternative sources of funding could be pursued. Funds might be collected from state specific development funds for improving the rural teledensity in that state. Also, grants from other government sources for specific projects targeting improvement in rural teledensity can be acquired. Providing VPTs should be restructured. At present, the emphasis is

on connecting villages by a single telephone. The provision of VPT could follow the cluster approach, where the telephone access points could be brought near to each other in a specified area and then spread to other distant areas. This approach is likely to be more cost effective. The assessment of roll-out under USF should be done in a way so as to improve and accelerate rural service provision. Further, comparing the penetration of telephones in areas which are covered under USF and which are not should be done simultaneously so as to assess correctly the impact of policy initiatives. While TRAI publishes quality of service indices for the telecommunications services, separate periodic analysis of quality of service in rural areas should also be done.

The main thrust of policymakers as regards improving telephone penetration, both in urban and rural areas has been improving teledensity. However, teledensity as a measure of telephone density is not accurate. In urban areas where most households have more than one wireline telephone, urban teledensity does not represent the correct picture. Measuring rural teledensity might give a correct picture in terms of villages covered, it does not show the actual access of telephones. Public telephones show the penetration in rural areas better and policymakers should concentrate more on public access in rural areas than private areas. With private operators building tariff barriers around their network, there has been an increasing trend among urban subscribers to own multiple mobile telephone connections. This, while improving the absolute number of wireless subscribers, does not present the correct picture. Instead of looking at the absolute number of wireless subscribers the policymakers should devise a way to look at the actual number of customers who subscribe to different operators, thereby giving a more correct picture of not only wireless subscriber base but also the extent of competition in the market. The growth of wireless segment has been phenomenal in the rural areas. However, it would be interesting to look at the socio-economic characteristics of the wireless subscribers in the villages.

Recently, the private operators have started providing internet and broadband services in urban areas. With this market segment having huge potential of growth, one might

see the private players undertaking infrastructural investments for providing broadband services. While this was one of the main reasons for the crash in the US telecommunications industry, one can only wait and see what the future holds in this segment of the market. To sum up, while the growth of the telecommunications industry has been phenomenal and by the current projections will continue be so. It is time when TRAI and DoT undertake a thorough analysis of the telecommunications sector so as to see the impact of its policies and promote better competition in the market.

Bibliography

- Aufderheide, P.: "The 1996 Telecommunications Act: Ten Years Later", *Federal Communications Law Journal*, Vol. 58, No. 3, 407-414.
- Baijal, P., (2004): "Telecommunications: Regulatory Wild West?", *Economic and Political Weekly*, February 21, 771-775.
- Bureau of Economic Analysis, www.bea.gov.
- Cave, M. E., S. K. Majumdar and I. Vogelsang (eds) (2002): "Handbook of Telecommunications Economics", Vol. 1, Elsevier, Oxford.
- Centre for Development of Telematics (C-DOT), Annual Report, 2004-05, New Delhi.
- Chowdary, T. H. (1998): "Politics and economics of telecom liberalization in India", *Telecommunications Policy*, Vol. 22, No. 1, 9-22.
- (2002): "Telecom Regulation and Consumer Welfare", *Economic and Political Weekly*, October 26, 4354-4356.
- (2003): "Rewarding Inefficient Incumbent: Regularising Rule-Breakers", *Economic and Political Weekly*, November 8, 4735-4736.
- (2004): "Telecom Reforms: A Decade On", *Economic and Political Weekly*, May 22, 2085-2087.
- Coffman, K.G., and A. Odlyzko (2002): "Growth of the Internet." In I. P. Kaminow and T. Li (ed.) *Optical Fiber Telecommunications IV B: Systems and Impairments*, New York Academic Press, 17-56.
- Communications Today (2000): "FCC Gets Split Decision on Collocation, March 21.
- Couper et al (2003): "Boom and Bust in Telecommunications", Federal Reserve Bank of Richmond, *Economic Quarterly*, Vol. 89/4.
- Crandall, R. W., (2002): "A Somewhat Better Connection", *Regulation*, (Summer), 22-28.

- Crandall, R., (2002): "A Somewhat Better Connection." *Yale Journal on Regulation* 25 (Summer): 22–28.
- Department of Telecommunications (DoT) (1994): *The National Telecom Policy*, Delhi.
- (1999): *The New Telecom Policy*, Delhi.
- (2009a): *Annual Report, 2008-09*, Delhi.
- (2009b): *Office of the Administrator, Universal Service Obligation Fund*, Delhi.
- Desai, A. V., (2006): "India's Telecommunications Industry: History, Analysis, Diagnosis", Sage Publications, New Delhi.
- Dossani, R., (2002): "Telecommunications reforms in India", *India Review*, 1:2, 61-90.
- Dunay, N. G., (2000): "Miles To Go: Fibre Build Booms – But For How Long?", March 1.
- Economidies, N (2004): "Telecommunications Regulation: An Introduction", NET Institute, wp #04-20.
- Federal Communications Commission (FCC) (1995): "In the Matter of Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier", CC Docket No. 95-427, Order, Adopted October 12, 1995, Washington D.C.
- (2000a): Docket No. 94-999-01 (Phase IIIA) Order on Collocation, January 21, Washington D.C.
- (2000b): "Chairman Kennard Says Trend Shows Telecom Consumers Get More Choices, Lower Prices: Hails Launch of 'Broadband Internet Age'", February 8, Washington D. C.
- (2000c): "Trends in Telephone Services", Industry Analysis and Technology Division, Wireline Competition Bureau, March, Washington D.C.
- (2002a): "Trends in Telephone Services", Industry Analysis and Technology Division, Wireline Competition Bureau, May, Washington D.C.

- (2002b): “Local Telephone Competition: Status as of December 31, 2001”, Industry Analysis and Technology Division, Wireline Competition Bureau, July, Washington D.C.
- (2004): “Statistics of Communications Common Carriers”, March 2, Washington D.C.
- (2006): “Local Telephone Competition: Status as of June 30, 2005”, Industry Analysis and Technology Division, Wireline Competition Bureau, April, Washington D.C.
- (2008): “Trends in Telephone Services”, Industry Analysis and Technology Division, Wireline Competition Bureau, August, Washington D.C.
- Fransman, M.: “Analysing The Evolution Of Industry: The Relevance Of The Telecommunications Industry”, University of Edinburg.
- Gasman, L., (2005): “Who Killed Telecom? Why the Official Story Is Wrong”, Cato Institute, No. 533, February 7.
- Goldstein, F. R., (2005): “The Great Telecom Meltdown”, Artech House, Norwood.
- Government of India, (2005): Press Note No. 5 (2005 Series), Ministry of Commerce and Industry, Delhi.
- Gupta, R. (2002): “Telecommunications Liberalization: Critical Role of Legal and Regulatory Regime”, *Economic and Political Weekly*, April 27, 1668-1675.
- Handley, J. (2005): “Telebomb: the truth behind the \$ 500-billion telecom bust and what the industry must do to recover”, American Management Association, New York.
- Harmantzis, F. C (2003): “Inside the Telecom Crash: Bankruptcies, Fallacies and Scandals”, March 30, New Jersey.
- Hundt, R., (2006): “Ten Years Under the 1996 Telecommunications Act”, Keynote speech delivered at the *Telecommunications Act of 1996: Ten Years Later* Symposium, February 6, George Washington University.

- Jain, R. (2004): "A Review of Telecom Regulatory Authority of India's Tariff and Interconnection Regulation", *India Infrastructure Report*, 239-251.
- (2005): "Accelerating Indian Rural Telecom Services: Policy and Regulatory Approaches", IIM, Ahmedabad.
- (2006): "Interconnection Regulation in India: Lessons for Developing Countries", *Telecommunications Policy*, Vol. 30, 183-200.
- Jhunjhunwala, A., B. Ramamurthi and T. A. Gonsalves (1998): "The Role of Technology in Telecom Expansion in India", *IEEE Communications Magazine*, November, 88-94.
- Jorde et al (2000): "*Innovation, Investment and Unbundling*", Yale Journal on Regulation, Vol. 17, No. 1.
- Kennard, W. E. (2000): "*Telecommunications @ the Millennium: The Telecom Act Turns Four*", February 8, FCC, Washington DC.
- Kimmelman et al (2006): "The Failure of Competition Under the 1996 Telecommunications Act", *Federal Communications Law Journal*, Vol. 58, No. 3.
- Kimmelman, G., M. Cooper and M. Herrera: "The Failure of Competition Under the 1996 Telecommunications Act".
- Laffont, J and J. Tirole (2001): "Competition in Telecommunications", MIT Press, Massachusetts.
- Lenard, T. M., (2002): "The Economics of the Telecom Meltdown", *The Progress and Freedom Foundation*, Progress on Point 9.6, February.
- Mani, S (2003): "Deregulation, Entry of MNCs, Public Technology Procurement and Innovation Capability in India's Telecommunications Equipment Industry", The United Nations University, Institute for New Technologies, Discussion Paper Series #2003-1.

- (2008): "Growth of India's Telecom Services (1991-2007): Can It Lead to Emergence of a Manufacturing Hub?", *Economic and Political Weekly*, January 19, 37-46.
- Mukherji, R. (2008): "The Politics of Telecommunications Regulation: State-Industry Alliance Favouring Foreign Investment in India", *Journal of Development Studies*, November 1, 1405-1423.
- Noam, E. M.,: "Deregulation and Market Concentration: An Analysis of Post- 1996 Consolidations", *Federal Communications Law Journal*, Vol. 58, No. 3, 539-550.
- Noll, R. G., and S. J. Wallsten (2006): "Universal Telecommunications Service in India", *India Policy Forum*.
- Odlyzko, A., (2002): "Measurements and Mismeasurements and the Dynamics of Data Traffic Growth." *Computer Measurement Group's 2002 International Conference*, December 11, Reno, Nev.
- Rao, S. and S. K. Singh (2004): "Telecom Port Changes and IUC Regulations: Some Issues", *Economic and Political Weekly*, October 16, 4628-4630.
- Sadka, G., (2006): "The Economic Consequences of Accounting Fraud in Product Markets: Theory and a Case from the US Telecommunications Industry (WorldCom)", June 1, New York.
- Sidak, J. G., (2003): "The Failure of Good Intentions." *Yale Journal on Regulation* 20 (Summer): 207-67.
- Sinha, N (1996): "The Political Economy of India's Telecommunication Reforms", *Telecommunications Policy*, Vol. 20, No. 1, 23-98.
- Telecom Regulatory Authority of India (TRAI) (1997): "Telecom Pricing: Consultation Paper on Concepts, Principles and Methodologies", Consultation Paper No. 97/1, November 4. Delhi.
- (1998): "Consultation Paper on Framework and Proposals", Consultation Paper No. 98/3, Delhi.

- (1999a): "Consultation Paper on Certain Aspects of Calling Party Pays (CPP) for Cellular Regime", Consultation Paper No. 99/4, August 31, Delhi.
- (1999b): "Consultation Paper on Issues Relating to the Cellular Mobile Services", Consultation Paper No. 99/6, Delhi.
- (2000a): "Consultation Paper on Universal Service Obligation", Consultation Paper 2000/2, September 3, Delhi.
- (2000b): "Consultation Paper on Policy on Policy Issues relating to Limited Mobility by the Use of WLL System in Access Networks", Consultation Paper 2000/4, June 12, Delhi.
- (2001): "Recommendations of the TRAI on Universal Services Obligation", Delhi.
- (2002): "Consultation Paper on Tariffs for Cellular Mobile Telephone Services", Consultation Paper 2002/3, July 8, Delhi.
- (2003a): "Consultation Paper on IUC issues", Consultation Paper No. 2003/1, May 15, Delhi.
- (2003b): "Preliminary Consultation Paper on Unified Licensing Regime", Consultation Paper No. 5/2003, November 15, Delhi.
- (2004a): "Consultation Paper on Unified Licensing Regime", Consultation Paper No. 6/2004, March 13, Delhi.
- (2004b): "Draft Recommendations on Unified Licensing", August 6, Delhi.
- (2004c): "Consultation Paper on Growth of Telecom Services in Rural India", Consultation Paper No. 16/2004, October 27, Delhi.
- (2005a): "Recommendations on Unified Licensing", January 13, Delhi.
- (2005b): "Recommendations on Growth of Telecom Services in Rural India", October 3, Delhi.
- (2006): Notification No. 409-5-2005-FN, February 23, Delhi.

----- (2008a): "TRAI Determines Final Phasing Out of ADC", Press Release No. 29/2008, March 27, Delhi.

----- (2008b): Annual Report, 2007-08, Delhi.

Virmani, A., (2004): "Competitive Access to Telecom: Spectrum Policy and M&A", *Economic and Political Weekly*, February 14, 620-622.

Warf, B., (2003): "Mergers and Acquisition in the Telecommunications Industry", *Growth and Change*, Vol. 34, No. 3, (Summer), 321-344.

www.cdote.com/about_us/success_stories.htm

