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The (Continuing) Evolution of India's Telecom Policy

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ABSTRACT

This paper traces the evolution of India's Telecommunications policies from its colonial days to the present time. The policies have undergone major shifts. During the British rule of India, the policies were strictly motivated by the colonizer's need to control the native population. After independence, the policies were dictated by the need for self-sufficient development and Fabian socialism, which led to other problems that curtailed telecommunications growth in India. In the last decades of the twentieth century, sheer economic survival imperatives led to the gradual opening up of India to market economies. This gave impetus to accelerated growth in the telecom sector. However, while the growth of India's telecom sector, especially the cellular telecom sector has been spectacular in the last decade, the basic question of whether it has actually achieved the avowed developmental policy objectives of the government remains in doubt. This paper seeks to critically focus on evolution of telecommunications policies in India, discuss the philosophy behind the policies, their successes and failures over the years, current trends and the future outlook for telecommunications in India.

INTRODUCTION

India is currently considered a global powerhouse of Information Technology (IT) and IT-enabled services (ITeS). According to Nasscom, India's software industry trade association, nearly 2 million people are currently employed by the IT industry (Nasscom, 2008). In addition, according to the Nasscom-McKinsey Report (McKinsey, 2005) the IT-ITeS sector is estimated to have helped create an additional 3 million job opportunities through indirect and induced employment, such as those created in telecommunications, power, construction, facility management, transportation, catering and other services. With its low-cost, high-tech, English speaking workforce, India has clearly benefited from the global IT outsourcing trend. According to the Nasscom Indian IT industry factsheet (Nasscom, 2008), the Indian IT-BPO industry is expected to grow by 33 percent and reach US$ 64 billion in FY 2008. Out of this, IT exports are expected to cross US$ 40.8 billion in FY 2008, an increase of 28 percent over FY 2007. In fact, every sub-sector of India's IT industry has experienced accelerated growth rates since 2004, as attested by the graph (Figure 1) shown below. The variety and share of service offerings are provided in Figure 2.

Today India's cities bustle with technological progress fueled by its IT industry. More and more Indians work in the IT industry and more and more Indians have access to the Internet, which is used for e-commerce, e-governance, rural development and information dissemination and communication. However, not everybody agrees with this picture of development. Major segments of Indian intelligentsia argue that despite the much-hyped growth, India's development is lopsided, with rural areas largely underdeveloped and untouched by technology developments in urban areas. This is especially so with regards to the reach of information and communications technologies (ICT) in rural areas. More than 700 million Indians live in rural areas, and far-flung villages do not yet have basic services such as electricity, sanitation and water, much less telecommunication services. The prohibitive costs of connecting rural areas and the non-availability of appropriate, cost-effective technologies that work in remote rural areas have been cited as main reasons for the lopsided development.

Figure 1: Indian IT Industry-Sector-wise break-up (from Nasscom, 2008).

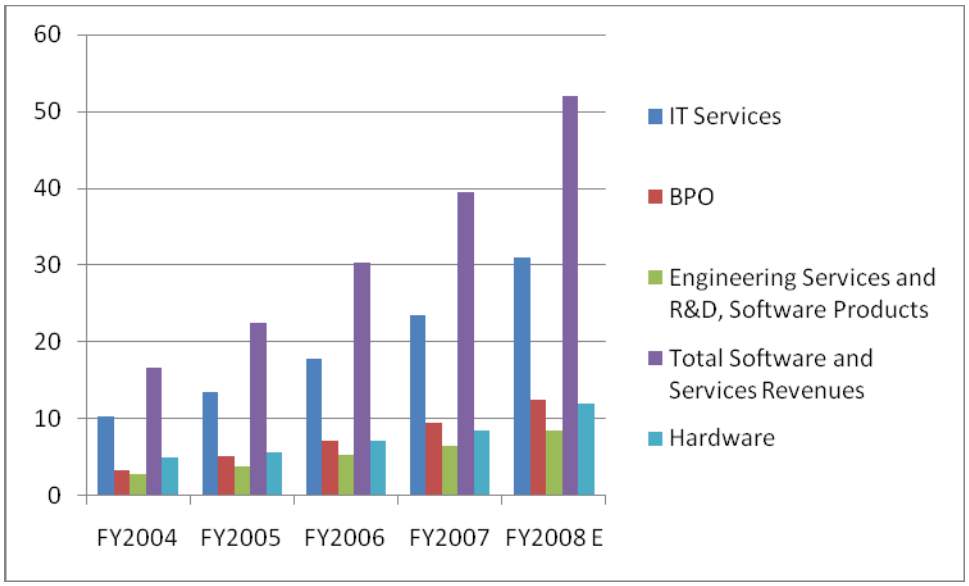
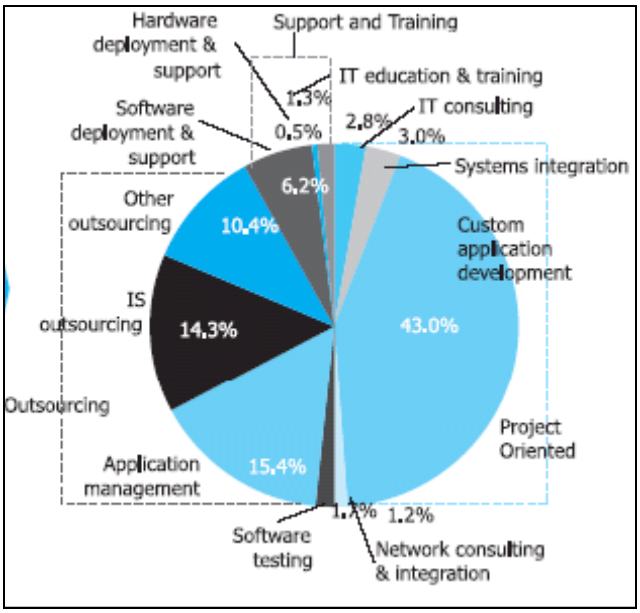


Figure 2: Service offerings in IS services (from Nasscom, 2008).



This situation is gradually receiving increased attention from politicians, governmental agencies, technologists and non-governmental agencies (NGOs). That is not to say that the issues have not received any attention in the past. The Government of India (GOI) has always been interested in rural development, and has actively tried to influence and engineer rural development through technology policy, over the years. However, those efforts have gained much stronger focus during the last decade of the twentieth century, coinciding with the gradual liberalization of India's economy coupled with the above-mentioned growth of India's IT sector. Today there is increasing emphasis on narrowing the "digital divide" by bringing IT developments, especially telecommunications and the Internet to rural areas. Telecommunications technology is considered to be a vehicle to bring economic development to rural India,

which in turn would enable further telecommunications use and development. Given this, the issue of rural telecommunications is being addressed at several levels: The governmental level, non-governmental level (NGOs), private-enterprise level and the scientific/research level (at academic and research institutions). New telecommunications policies that more clearly reflect the new economic, political and technological realities that have emerged in the last decade of the twentieth century have been proposed and enacted. Several NGOs have undertaken rural networking projects with the help of international aid agencies. New policies have opened up the telecommunications arena to private enterprises, and this has led to the development of greater telecommunications infrastructure in the country. This paper seeks to focus on evolution of telecommunications policies in India, discuss the philosophy behind the policies, their successes and failures over the years, current trends and the future outlook for telecommunications in India. Our information comes primarily from published literature, conference presentations, personal interviews and newspaper articles.

THE COLONIAL HISTORY OF TELECOMMUNICATIONS IN INDIA

India officially came under the British rule in 1757, when Robert Clive led the forces of the East India Company and defeated the army of Siraj-ud-daulah, the Nawab (Muslim equivalent of the King) of Bengal (Lal, 2008). In 1848, James Andrew Broun Ramsay, Marquee of Dalhousie (1812 – 1860), also known as Lord Dalhousie, was appointed the governor - general of India by the East India Company. His mission was simple: to unify India, a land of numerous kingdoms, and control it. Under his enthusiastic support, the first telegraph lines in India were laid in 1851 by the British government. These were mostly installed near Calcutta, which was then the headquarters of the British government in India. The British rulers were primarily interested in telecommunications as a law-and-order maintenance tool (Headrick, 1998). In 1876, Alexander Graham Bell was issued a patent for inventing the telephone (Bell, 1876), and in 1877 the Bell Telephone Company was created. Less than five years hence, in 1881, British firms brought the first POTS (Plain Old Telephone Service) to India. These firms were granted license to operate until 1944 by the British government. At the time of India's independence in 1947, these firms had set up 321 telephone exchanges, mostly in five Indian cities, 86,000 working lines and 338 long-distance public-call offices. The telephone density (teledensity) was 0.025 (Mody, 1995). *Teledensity* is defined as the number of telephones per 100 people. The Indian Post Office and the Indian Telegraph Department operated as two separate services until 1914, when they were joined together under a single Director-General.

THE POST-INDEPENDENCE PERIOD

After independence, the Indian leaders led by India's prime-minister Jawaharlal Nehru adopted a socialist economic model for India, marked by central planning. A cautious India was determined to attain security and self-sufficiency without the help or assistance of any extraneous nation. Indigenous industrial development was the "mantra" of the newly formed nation and its leaders. In such a climate, overt capitalism, foreign investment and foreign collaboration in any industrial endeavor were either disallowed or frowned upon. Industrial and economic policies that reflected these ideals were created. This brought about the "license raj" or rule-by-permit era in India. Any type of entrepreneurial endeavor was guided and permitted only through permits, with complicated rules for obtaining them. Foreign imports of equipment were strictly regulated. Foreign collaborations were controlled. The general perception was that the state could be trusted, whereas the market could not. Large state enterprises were set up for all industrial sectors (e.g. oil, gas, steel, electronics, power, minerals). The Indian government decided that its telephone and telegraph systems would be a government monopoly administered by its own civil service (Menon, 1999). Thus, at the time of independence, all foreign telecommunications companies were nationalized to create the Posts and Telegraphs Department (P & T)[1], a state-run monopoly. In doing this, the central government retained complete control of telecommunications, a legacy of British colonial rule which had enacted the Indian Telegraph Act of 1885 which gave the central government complete authority over telegraph technology. In addition, P & T provided employment for hundreds of thousands of Indians, thus becoming a vehicle for employment and welfare.

Under the P & T monopoly, telephones were not considered as an essential service. Rather, it was considered to be a luxury. New telephone lines were added only to cities and metropolitan centers. Service and maintenance were poor. International connectivity was poor. A 2003 paper presented by Rajendra Singh at the International

[1] The P & T Department is also referred to variably as the PTT (Posts, Telegraphs and Telecommunications Department.

Telecommunications Union (ITU) workshop in Mongolia (Singh, 2003) shows that even in 2002, the waiting list for telephone connections in rural India was about 1 million. During the years of the P & T monopoly, rural telecommunications infrastructure underwent a benign neglect. There was no shortage of lip service provided by politicians who clearly saw the potential of telecommunications to national, especially the development of India's nearly 600,000 villages, where 70% of the population lived. But real developments were woefully short in coming. As stated by Bella Mody (Mody, 1995), unlike other industry sectors deemed critical for national development and security (i.e. energy, manufacturing, nuclear technology, etc.), telecommunications did not have any champions. Research and development in the telecommunications sector was non-existent. The P & T often procured obsolete technology from other countries and tried to adapt them to local conditions. Other problems included the enormous cost of developing infrastructure in rural India, and the rural populace's low level of economic development, which severely undercut such a population's ability to pay for telecommunications service. As suggested by Souter (Souter, 1999), the economic development of rural areas depends on telecommunication infrastructure and related services. But such infrastructure and services cannot occur unless the rural population has enough disposable income to purchase telecom services.

As noted by Jain and Sridhar (Jain & Sridhar, 2003), the level of investment required for rural telecommunications development cannot be practically borne by just a government-run monopoly – infusion of capital from the private sector is very important. However, that was not possible under the Indian regulatory conditions. In a period of 50 years, from 1948 to 1998, the total growth in teledensity was a shocking 1.92 percent. Much of India did not have any telecommunications facilities. In areas that did have telecommunications, the equipment was obsolete, the service was scratchy, and the cost was very high.

THE BEGINNINGS OF ECONOMIC LIBERALIZATION AND EFFECTS ON TELECOM POLICY

By the early 1980s, the Indian policy makers began to realize that India's closed economy, with its Byzantine rules and policies had not resulted in the development that had been hoped. Instead, the permit raj had only increased corruption, enhanced protectionism and resulted in an inefficient economy. Since the 1960s, the Government of India had made up for shortfalls in its economy, and subsequent decrease in exports and increase in imports, through financial aid from agencies such as the International Development Agency (IDA), The Asian Development Bank (ADB) and the International Monetary Fund (IMF) and the World Bank. But in the early 1980s, the United States, under Ronald Reagan, started getting decidedly unenthusiastic about continuing aid and loans under favorable conditions to India. Under these tightening financial conditions, the Indian Government, under Indira Gandhi, started takes steps towards liberalizing the economy by relaxing some import restrictions, which would enable eventual exports enhancements from India. In 1984 Rajiv Gandhi was elected prime minister. He embarked on a program of easing restrictions on the import of high-tech items, especially electronics, computers and telecommunications equipment. India's economic restructuring began during this time.

In 1985, telecommunications was separated from P & T, and the Department of Telecommunications (DoT) was set up, under the Ministry of Communications and Information Technology. The DoT became the exclusive provider of both local and long distance services. It was headed by career bureaucrats, and followed strict bureaucratic administrative procedures. According to Mody (Mody, 1995), due to the separation of telecommunications from the P & T, the profits that accrued from telecom remained within the DoT. But clearly, the combination of bureaucracy, welfare-type employment, and bad technology made the services far from satisfactory. Within one year, complaints about on the poor service from DoT started coming in from government, businesses and private users. This led in 1986 to the creation of the Mahanagar Telephone Nigam Limited (MTNL), a public-sector "corporation" to run the telephone services in metropolitan areas such as Delhi and Mumbai. The Videsh Sanchar Nigam Limited is another public-sector corporation, was also created 1986 to run international telecommunications. This was the "corporatization" of the government's department. It was hoped that this move would bring professionalism to telecommunications. Employees were eligible for profitability based salary raises. But these corporations were still controlled, directly or indirectly, by the DoT. Rajiv Gandhi had initiated the de-monopolization of the telecommunications sector, but the DoT selected the firms and the technologies for importing foreign technologies.

The heavily unionized DoT was unhappy with this corporatization, nevertheless. They saw this as the first step towards privatization. They protested the higher wage earning potential of the newly formed corporations. This

resulted in the appointment of a committee, the Athreya Committee, to restructure DoT. The Athreya Committee recommended further corporatization and recommended *five* independent corporations, with MTNL at the apex, and recommended that DoT become an independent regulatory agency (Athreya, 1991). However, this recommendation was not taken up seriously by the ministers and politicians who feared further backlash from the labor unions and DoT bureaucrats. The same ministers and bureaucrats also rejected recommendations (by the Rangarajan Committee of the Reserve Bank) for government disinvestment of up to 49% in public-sector companies. Nevertheless, more and more modern telecommunications equipment started being manufactured in India by Indian firms with tie-ups with foreign companies.

CONNECTING RURAL INDIA: THE ROLE OF THE NON-RESIDENT INDIAN

India's efforts at developing rural areas through telecom connectivity got a big boost in 1984 through Sam Pitroda, an Indian technologist and entrepreneur settled in the U.S. Sam Pitroda went to the U.S. in the 1960s for a graduate degree in electrical engineering from the Illinois Institute of Technology, and then worked at GTE, where he quickly earned several patents in the field of telecom switching technology. He then became at partner at Wescom Switching, where his switching equipment was sold. He later sold his stake to Rockwell International for $ 50 million (Economist, 1987). A vacation in India in 1980 brought him face to face with the Indian telecom situation, and Pitroda decided to focus on helping Indian telecom achieve its objective of connecting rural areas. Under the patronage of Prime Minister Indira Gandhi, he started the Center for Development of Telematics (C-DOT), an autonomous (but government-backed) organization set up to research and develop telecom switching systems to connect villages and cities. Under Pitroda's leadership, C-DOT quickly produced four switches on schedule. These switches soon went into mass production. Pitroda started the concept of the PCO, or Public Call Office, which is a small shop located in markets, grocery shops, pharmacies, and other public places. Each PCO was equipped with a public phone manned by entrepreneurs. The entrepreneurs took a small commission on the use of the phone. The PCOs thus became an employment vehicle while providing telecom connectivity to much of India in the 1980s. They soon became ubiquitous in India's vast countryside and cities. The PCO phones worked well, and used the switches developed at C-DOT. But Pitroda's success and access to the Prime Minister earned him accolades as well as criticisms from competitors which included Alcatel, a Dutch company that produced switches in India. In 1987 Pitroda joined the Rajiv Gandhi government as Minister of State for Technology. In 1989 he became the first elected non-DoT head of the Telecommunications Commission, the formal policy-making body of the DoT. However, according to Mody (Mody, 1995), this policy-making body did not achieve much due to inter-ministerial turf battles, such as whether electronic switches should be under the control of the Department of Electronics or continue under DoT. Again, Pitroda's close connection with the Prime Minister's office led to charges of corruption. After Rajiv Gandhi's death in 1991, Pitroda resigned from the Telecom Commission and decided to move back to the U.S. (Hughlett, 2007). Pitroda's efforts however have been very successful. Today, C-DOT's product portfolio spans world-class Digital Switching Systems, Intelligent Network Solutions, Access Network products, Voice over IP solutions, SDH & WDM technologies, Satellite Communication Systems, Network Management Systems and Operation Support Systems (C-DOT, 2008). C-DOT's achievements, listed on the same web site, include:

- Technology based Systems from 200 Lines to 40,000 lines capacity in operation
- More than 30,000 C-DOT Exchanges totaling approximately 25 million telephone lines installed and operational in field
- Deployment of telecom equipment valued at Rs. 7500 Crore (approx. $ 1.6 billion)
- Significant technology transfer and royalty earnings
- Technology development with low capital investment
- A large reservoir of technical manpower in telecom
- Establishment of a technology transfer process for production by multiple manufacturers

It is interesting, however, the Sam Pitroda's name is absent in the entire web site – perhaps testifying to the many inter-ministerial conflicts as well as other battles that had to be faced by policy makers who wanted to change India's telecom bureaucracy in the 1980s.

THE 1991 FINANCIAL CRISIS AND ITS AFTERMATH

Then in 1991, there was another foreign exchange crunch, resulting from a combination of factors, such as the 1990 Gulf war, the rising price of oil, decreased remittances from Indian abroad, rising prices, and an ever increasing import cost despite rising exports. By mid-year 1991, India's balance of payments fell to a serious low, with only about two weeks' worth of import funds left in her treasury. Prime Minister PV Narasimha Rao desperately sought the help of international aid agencies and development banks and secured emergency loans from the IMF. This resulted in another major intervention by international lending agencies, requiring more structural adjustments to be undertaken, such as devaluing the Indian rupee by twenty percent. This again resulted in further opening of the Indian economy.

This external effect actually had a positive effect on the Indian Electronics and Telecommunications industries. Electronics and Telecommunications were recognized as being vital to increase exports, elevate the growth of enterprises, both public and private, and develop rural areas of India. Lending agencies argued that deregulation would increase private investment and increase competition. The financial reforms undertaken by India soon led to increased exports, more foreign investment, and resulted in a healthy foreign reserve situation in just a few years. PV Narasimha Rao and his Finance Minister, Dr. Manmohan Singh are credited with this turnaround of the Indian economy – they were under pressure to undertake bold reforms, and at the same time they faced strong opposition from the country's socialists against reforms. In retrospect, their action in opening up the economy seems to have been the right policy.

In our view, the reforms also gave a big boost to enhancing telecommunications infrastructure. The reforms succeeded in opening up telecommunications to the private sector. Further, limited joint ventures were allowed even in the public sector telecom companies. Thus the economic liberalization policies started in the late 1980s ushered in liberalized telecommunications policies.

POST 1991 TELECOM POLICY – TAKING THE MIDDLE PATH

The economic liberalization started by the Narasimha Rao government in 1991 led to further pressures on the government to break down the walls of government monopoly in telecom services. In 1994, the National Telecom Policy (NTP 1994) was announced. The policy gave the lion's share of the nation's telecommunications development to the DoT and its corporations. It allowed only a supplementary role for the private enterprises. The lucrative long distance and international services were retained by DoT. Only the local loop, which required heavy investments in fiber-optic cables were opened to private enterprises – the new entrants. The policy makers chose to disregard urgings by the World Bank to completely privatize telecommunications. Instead, they chose a middle path. The new entrants would be allowed to compete for the rest of the services after meeting their commitments in the local loop area. This duopolistic arrangement and the retention of a strong incumbent have been noted by Mody (1995) and Rajat Kathuria – who was a Director of Economics at TRAI (Kathuria, 2000). In addition to basic services, NTP 1994 also opened up the telecom sector to value added services such as wireless (cellular) services, radio paging, etc.

According to Pradipta Bagchi (Bagchi, 2000), "the DoT imposed strict conditions, ostensibly to ensure a balanced nationwide growth in telecommunication services especially in the rural areas. The conditions, which were subsequently highlighted in National Telecom Policy 1994 included:

- The private entity had to be a joint company formed with the participation of an Indian company
- Licensees must give at least 10 percent of all lines to rural areas
- The licensee's network must cover all the districts in the area within 24 months
- Prices charged by the DoT (where it was the competitor) would be ceiling for the prices that private sector firms could charge; of course, they had the freedom to charge a lower rate."

As far as NTP 1994 was concerned, the DoT was the policy maker as well as the competitor. There were impediments placed on private entrants. The investments required by them were under-estimated. Meanwhile, the technology was changing rapidly, which required even larger initial investments to be made. This discouraged several private enterprises from entering the telecommunications market. Rural telecommunications suffered the

most from this situation. As a solution, in 1997, the Telecommunications Regulatory Authority of India (TRAI) was set up as an independent arbitrary authority to manage and influence the telecommunications industry. The TRAI Act of 1997[2] granted TRAI the power to regulate and oversee all telecommunications matters, and thus enjoyed power over the DoT, which was until then the telecommunications policy-maker. TRAI's power however was short-lived. In 1998, when TRAI tried to block MTNL from entering cellular services, DoT filed a lawsuit, and the courts ruled in DoT's favor. Justice Usha Mehra noted that TRAI was only a regulatory body, and did not have the power to grant licenses, which rested only with DoT (Ganapati, 1998). Thus, it seemed apparent that DoT could still control policy-making.

In 1999, a new Telecom Policy (NTP, 1999) was announced. The aim was to start afresh, as prior policy changes had not brought forth the liberalization or the increase in teledensity as expected, especially in rural areas. A "Group on Telecommunications" was created to develop NTP 1999, presumably without representation from either DoT or TRAI. The objectives of the new National Telecom Policy (1999) were, as noted by Bagchi (2000):

- Provision of universal service to all uncovered areas, including rural areas
- Create a modern telecom infrastructure taking into account the convergence of IT, media, telecom
- Transform telecom sector to a competitive environment providing equal opportunities and level playing field for all players

The policy also set several landmarks and targets to be achieved in the next ten years, such as (Bagchi, 2000):

- Telephone on demand by the year 2002
- Teledensity of 7 by 2005 and 15 by 2010
- Telecom coverage of all villages by 2002
- Increase rural teledensity from 0.5 to 4 by 2010
- Internet access to all district head quarters by October 2000
- Internet access to all villages by 2002

As can be seen above, the teledensity targets were ambitious. To meet the targets, the NTP 1999 envisaged multiple operators. The license fee system was changed to a one-time fee with revenue sharing payments. Limitations in the NTP 1994 which caused major expenses to private entrants (such as specifications on the local loop cables), were reduced to facilitate, rather than hinder, private entrants to meet the targets. Other important issues addressed, as noted by Kathuria (Kathuria, 2000) were:

- Speeding up competition in long distance services by opening up long distance and international services to private entrants
- Permission for Fixed Service Providers (FSPs) to carry long-distance traffic within their service areas without requiring additional licenses
- Clarity regarding the number of licenses issued to each operator
- Review interconnectivity issues and tariffs (since until then the inter-connectivity between two operators was provided via DoT/MTNL)
- Convergence of telecom and broadcasting industries
- A transparent process for wireless spectrum allocation
- Quality of service, consumer welfare

The government sought TRAI's recommendations to implement several of NTP 1999 policies. However, after the much publicized lawsuit by DoT against TRAI, and the subsequent court ruling in favor of the DoT, there was an imperative for the government to amend the TRAI Act of 1997. In 2000, the government realized that TRAI had to be reconstituted, with more powers and independence. The TRAI Amendment Act of 2000 took away TRAI's dispute-resolution responsibility, and made it into an advisory body whose recommendations would be non-binding on the government, licensor or the DoT. The amendment set up an Appellate Tribunal known as the "Telecom

[2] THE TELECOM REGULATORY AUTHORITY OF INDIA ACT, 1997, Published by the Gazette of India. http://www.trai.gov.in/trai_act.asp

Disputes Settlement & Appellate Tribunal (TDSAT)" to adjudicate disputes that might arise. However, TRAI's authority was strengthened in the following areas (from (Kaushal, 2000)):

- Frequency Spectrum Management (for wireless communications)
- Powers regarding tariffs, inter-connection, quality standards, time-period for providing circuits between different service providers.
- The amendment overriding powers to TRAI even over the terms of the license, as far as inter-connectivity was concerned.

TRAI was, in effect not a regulatory body at all, because it had no powers for enforcement. It was strictly an advisory body. While this made TRAI's position clear, it still showed that the government was not entirely willing or committed to full corporatization of the functions of the DoT (Kaushal, 2000).

These developments have, as predicted, introduced competition and increased private sector participation. In 2000, the government took the next step towards corporatization of telecom, by carving out a new corporation from DoT called Bharat Sanchar Nigam Limited (BSNL). BSNL was responsible for providing total telecom services (cellular, fixed wireless and fixed line) to all circles and cities other than Mumbai and Delhi (which were served by MTNL). With this move, DoT became a policy making, licensing and coordinating organization in all matters pertaining to telecommunications. However, whether all these developments truly made telecommunication accessible to rural populations was debatable. India's teledensity was still one of the lowest in the world. Indrani Kaushal (Kaushal I. , 2000) noted that India's total teledensity at the end of 2000 was 2.68 – the rural teledensity at 0.68 and the urban teledensity at 8.36.

WIRELESS TELECOM POLICIES

In 1995, Indian telecom entered the wireless age, and the first wireless phone call was made, again, coincidentally, from Kolkata (Calcutta), by the then Chief Minister Mr. Jyoti Basu (Bhatnagar, 2005). (Note that the first telegraph and telephone lines originated from Calcutta over a century earlier).

From 1991 onwards, the DoT started auctions to provide licenses to private enterprises for operating wired and wireless telephone services. As discussed in the above paragraphs, the primary policy objective of the government was to enhance the spread to telecommunications to rural areas, and the auctioning policies and mechanisms adopted strictly followed this objective. The country was divided into roughly twenty "circles[3]," with the four metropolises of New Delhi, Mumbai (Bombay), Kolkata (Calcutta) and Chennai (Madras) being considered separate entities not belonging to any of these circles. Further, the circles were divided into category A, B and C, depending upon how close these were to larger metropolitan areas. The circles (as of 2007 end) were as follows (Table 1):

Table 1: Telecom circles in India.

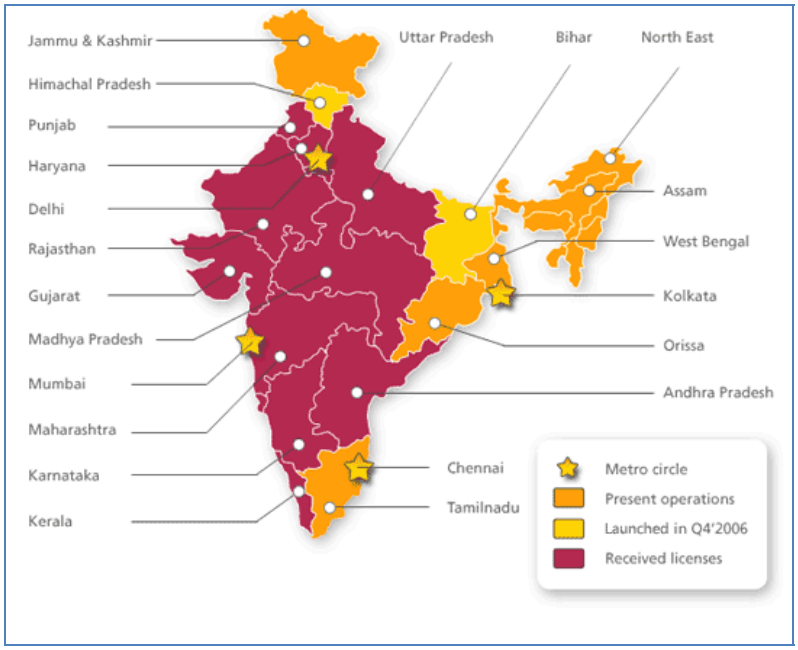
Metro circles	**A circles**
• Mumbai • New Delhi • Kolkata • Chennai	• Andhra Pradesh • Gujarat • Karnataka • Maharashtra • Tamil Nadu
B circles	**C circles**
• Haryana • Kerala • Madhya Pradesh • Punjab • Rajasthan	• Assam • Bihar • Himachal Pradesh • Jammu & Kashmir • Northeast

[3] The circles correspond roughly to the number of states in India. Currently, there are 23 telecom circles in India, covering 28 states and 4 metropolises.

• Uttar Pradesh (East) • Uttar Pradesh (West) • West Bengal	• Orissa

Each circle would be allowed a maximum of two providers. Figure 3 shows a recent map corresponding to the telecom circles where the cellular operator Aircel has, or has applied for, operating licenses.

Figure 3: Map depicting India's telecom circles (from Aircel (http://www.maxis.com.my/personal/pic/about_us/intl_ventures/com_iv_india.gif)).



However, the early auctions were not considered to be successful at all. The right to operate, and thus the operating spectrum, was won by a few bidders who subsequently could not develop enough business, and thus defaulted on payments of license fees to the government. The winning bidders' inability to pay the fees could be traced to several reasons: the very high license fees charged by the DoT; the absence of any critical examination on the part of the DoT on the financial abilities of the bidders; the lack of adequate infrastructure, which further complicated the private companies' efforts in setting up telecom networks in rural areas; the insistence of a fixed airtime tariffs by the DoT; the lack of adequate planning with regards to "interconnectivity" of a cellular provider to other networks; arbitrary changes in interconnectivity fees charged by the DoT. There were also charges made by several private cellular telecom providers that favoritism guaranteed certain private providers with better spectrum allocation as well as laxity concerning some of the conditions pertaining to the "rural spread," i.e. the spread of telecom facilities to rural areas.

A further complication resulted from the adoption of different cellular standards – while almost all the initial cellular operators coalesced on the GSM standard, the wireless local loop, which was used by the fixed service providers, used the CDMA standard. In addition, a few key cellular providers started using the CDMA standard, which led to further complications related to interconnectivity as well as spectrum allocation. The problem of spectrum allocation extends to this day, when India's DoT is deciding on mechanisms for increased allocation of spectrum to cellular providers. One main problem is the fierce competition for spectrum from both CDMA and GSM operators, which has led to accusations of favoritism by the DoT from each of these camps.

THE INDIAN SPECTRUM TUSSLE

Despite all the policy problems surrounding India's cell phone industry, the country has been experiencing explosive growth in its cellular subscriber base. In February 2008, Indian cellular providers added an additional 8.46 million subscribers, bringing the total cell phone subscribers to 246 million, which makes the Indian market second only to China (Malik, 2008). However, this growth has not been matched from the service quality standpoint. Cellular subscribers have complained over the last few years that inadequate spectrum availability has led to quality problems, and have been pressuring the DoT to release more spectrum space (UPI, 2006).

The DoT's, and TRAI's response to this has again led to more confusion and acrimony rather than providing genuine solutions to the customers and the general exchequer.

The genesis of the current tussle on spectrum allocation came about in October 2007, when, under pressure from cellular providers, the DoT requested the release of some unused spectrum from the Indian military. TRAI, in October 2007, recommended that no new auctions be conducted for 2G spectrum, and that the new licenses be given to existing and selected new providers at the old 2001 licensing fee. The news of an impending additional spectrum allocation, especially at bargain prices, led to an explosion of 575 applications for licenses from the incumbent operators as well as several new operators (a total of 45 companies), including international providers who were spurred by the opportunities offered by the Indian cellular market's 23 circles. In addition, GSM providers applied for additional CDMA spectrum, and vice-versa, in a bid to operate in both markets (Willing, 2007).

This led to bitter acrimony among the major players, with the GSM's body Cellular Operators Association of India serving legal notice to the DoT cautioning it against the allocation of GSM spectrum to CDMA operators. In the meanwhile, the DoT, on the basis of TRAI's recommendations, had already allocated pan-India 2G spectrum at 2001 prices of Rs 1,651 crore, which, according to Shalini Singh of Times of India (Singh S. , 2008) has resulted in a near Rs 32,000 crore ($8 billion) loss to the exchequer – a calculation based on comparative auctions in the U.S.

This has led to a tussle between the DoT and TRAI, with DoT accusing TRAI of mismanaging the licensing processing for the increased spectrum. The GSM and CDMA operators continue to fight their battles, and even the Finance Ministry and Prime Minister's Office have become entangled in the war for spectrum, and spectrum allocation issues (Singh S. , 2008). In October 2007, the Minister for Communications and Information Technology, Mr. A. Raja categorically ruled out auctions for 2G spectrum (PTI, 2007). He immediately came under attack by the affected parties in the industry, and then announced, in November 2007that he was in favor of auctions for 3G spectrum (Singh S. , Raja backs auctions for 3G spectrum, 2007). In January 20, 2008, TRAI recommended that auctions be used to award 3G spectrum (PTI, "TRAI favours auction, speedy allocation of 3G spectrum", 2008). Whether TRAI's recommendations were influenced by the Minister's preferences stated in November 2007 remains an open question.

All of these events bring into the spotlight the complexities faced by the policy makers when it comes to developing and implementing telecom policies in India. There are several stakeholders, such as the Minister of Communications and Information Technology, whose focus is on the vote bank and his/her constituency. The industry is represented by two rival camps, the CDMA and the GSM camps, which are often at loggerheads with policies and recommendations from the third stakeholder, i.e. TRAI, depending upon perceptions on which camp is favored (or not favored at any point in time. The DoT is yet another stakeholder, as the final issuer of licenses. DoT has its own Telecom Commission which acts as its technical as well as policy making authority, which has historically been a rival to TRAI. When this mix is joined with the urban and rural populace, the Finance Ministry, the National Planning Commission (which sets targets for rural connectivity), the TDSAT (the telecom disputes resolution tribunal) and even the Prime Minister's Office, there is bound to be a tug-of-war among various entities, which could result in a muddle, or paralyze activities. Fortunately, despite all of these competing elements, the telecom industry has continued to grow in India, paralleling her national economic growth.

RURAL TELECOMMUNICATIONS: SUMMARY OF CURRENT STATUS

The current state of rural telecommunications can be gauged from governmental policy statements, report cards, published academic literature, "white papers" and status reports from NGOs. T the reports can be summarized as follows:

- The telecom sector in India has experienced strong growth, especially since the turn of the century. In November 2007, Indrani Kaushal, Deputy Economic Advisor, DoT, released the following "state of India's telecom" at the "Capacity Building Workshop on information Society Statistics: Infrastructure and Household Indicators" held on 6-8, November, 2007 in Bangkok (adapted from (Kaushal I. , 2000):
  - At the end of 2007, the Indian Telecom sector was third largest network in the world.
  - Subscriber numbers had crossed 250 million – thus exceeding the target set forth by NTP1999 and TRAI recommendations set in 2005 (TRAI, 2005).
  - The average growth rate of subscribers exceeded 40%.
  - The monthly additions of subscribers exceed 7 million.
  - Growth in the sector is primarily from wireless the segment with 84% growth in wireless and 16% growth in wired subscriptions.
  - At the end of 2007, the national teledensity stood at 22%, with rural teledensity at 7%, and the urban at 57% (Figure 4).
  - Further access is provided by 5.4million PCOs (public call offices) and 500000 VPT (village public telephony) systems.
  - The number of people connected to the Internet continues to rise, with 9 million Internet and 2.5 million broadband subscribers.
- Despite this progress, India still lacks in critical telecommunications infrastructure, especially in rural areas. One indicator of India's current standing in its overall development in ICT is the "Networked Readiness Index," (WEF, 2006) which is published yearly by the World Economic Forum[4]. India currently (i.e. 2005-2006) occupies the fortieth place, behind countries like Malaysia, Thailand and Tunisia.
- India's teledensity is still much lower than China's, whose teledensity reached 29 percent by the beginning of 2007.
- The main reason attributed to low rural teledensity in India is the high cost of providing telecommunications services in these areas, compared to the purchasing power of the rural populace. According to Ashok Jhunjhunwalla (Jhunjhunwalla, 2000), in developed countries, almost 90% of households can afford monthly charges of approximately $30 for telecommunications facilities, whereas in developing countries such as India, only about 5% or 6% of the households can afford such telecommunication expenditures.

As a result, the government has sought to control and set caps to the tariffs that the telecom operators can charge from consumers. Cellular and fixed line prizes have been steeply reduced. Average Revenue per User (ARPU) in India is thus the lowest in the world currently (Figure 5).

[4] The World Economic Forum (http://www.weforum.org/en/index.htm) is an independent international organization committed to improving the state of the world by engaging leaders in partnerships to shape global, regional and industry agendas.

Figure 4: Rural-urban teledensity (Kaushal, 2008).

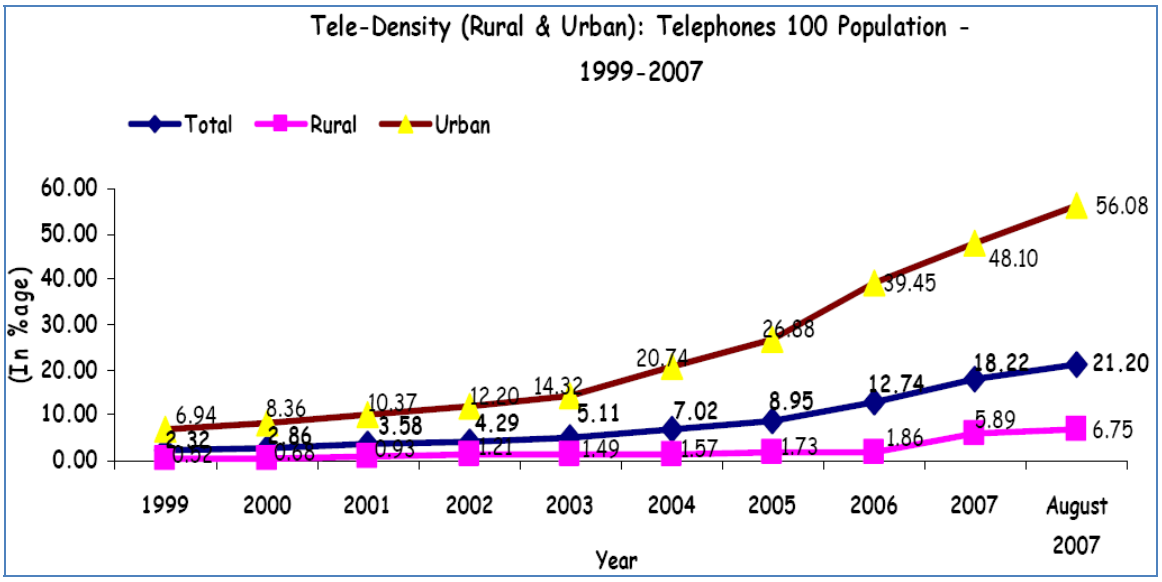
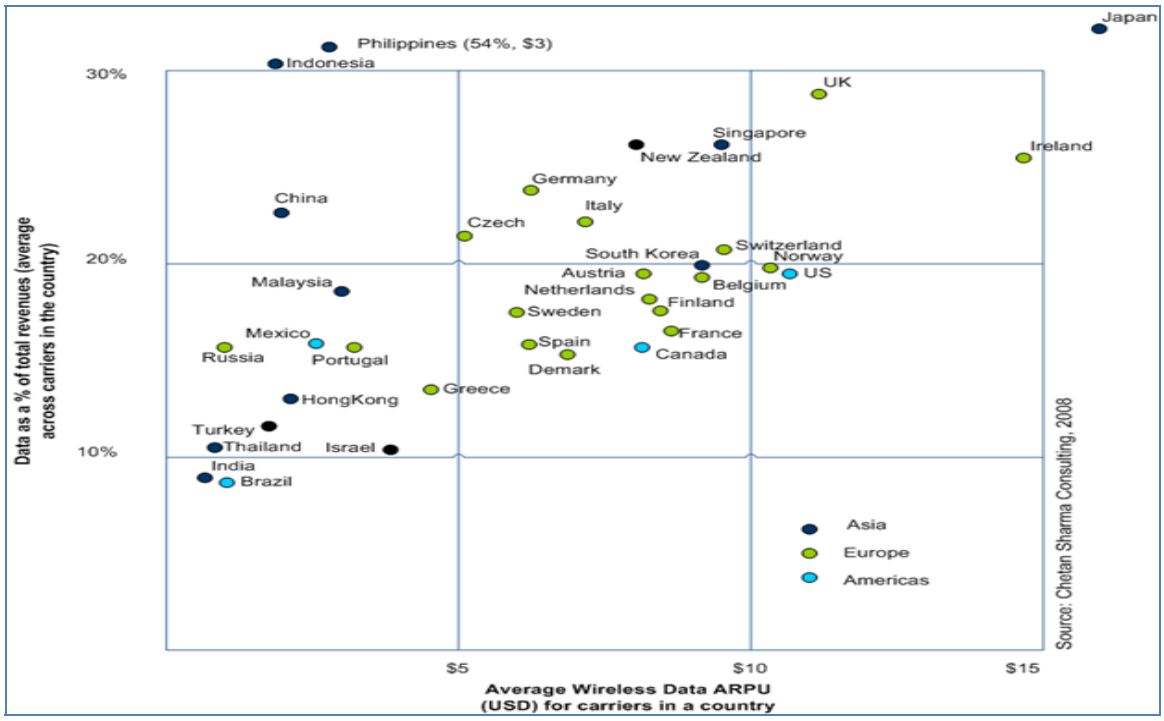


Figure 5: ARPU for wireless services.



- It has been suggested that one way to improve rural teledensity is to reduce the cost of the "last mile" (local loop) of telecommunications access using newer technologies such as a wireless local loop (Jain & Sridhar, 2003).
- Another possibility is to decrease the poverty of rural areas. When rural populations have more money to spend, they will be more amenable to spending it on telecommunications, which result in lowering the costs of providing telecommunications in rural areas and make the continued availability of telecommunications a sustainable prospect – and at the same time enhance rural economies.

- The current projects in rural telecommunications are being carried out by the state and federal governments, NGOs, academic and research institutions such as the Indian Institutes of Technology, with some collaboration from the industry in some of the projects. Several projects are underway in various parts of rural India.
- However, the sustainability and success of these projects are not certain.

As suggested by Sridhar and Sridhar (Sridhar & Sridhar, 2004), and one way to improve rural teledensity is to reduce the cost of access loop for providing telecom services using technologies such as wireless local loop. Increased rural teledensity will in turn increase the economic potential of these areas, which will cyclically further increase teledensity.

CONCLUSIONS AND FUTURE WORK

The Indian telecommunications industry has had a long history, starting from India's colonial times. Telecommunications has evolved from being an object to exercise control, to an object of state bureaucracy, to finally being recognized as an essential aspect and requirement of India's economic and social development. But the evolution has been anything but smooth. After India attained independence, its socialist-leaning leaders took it on a path of import-substitution and self-reliance at all costs. This led to an environment that shackled indigenous research, development and innovation. This environment gave rise to huge state-run monopolies. Even though the government has recognized these efforts as failures, and has started down a path of liberalization, it has not been as successful as one would have hoped, due to entrenched interests in the government and bureaucracy that did not want change. Political leaders have often shirked from decisive actions due to the need to stay in power. The legal environment and its outdated laws (i.e. the Indian Telegraphs Act of 1885) have not changed to incorporate the new realities. Interpretations of the laws have been confusing to say the least.

Given these ground realities, one can safely say that the state of Indian telecommunication is still a work in progress. As stated by Rekha Jain (Jain, 2001), the idea of wireless spectrum and license allocations through auctions was a good one, and the auction mechanisms were by themselves very good. However the government failed to generate expected revenues from this effort, and thus did not met its objectives of enhancing rural connectivity and increasing the teledensity due to faulty planning and implementation.

Looking at these developments, one can conclude that the Indian Telecom industry has come a long way from its British roots, but still has many more miles to go. Despite the problems, today there are several NGOs, universities and private enterprises working to enhance rural teledensity, with a view achieving the primary goal of India's telecom policy.

Some analysts have described the Indian efforts at telecom regulations as "muddled." Indeed, the approaches, recommendations and counter-recommendations, competing parties, lawsuits and recriminations do point to a muddled approach. However, it must be remembered that India is a functioning democracy, with a plethora of problems and interested parties with their own supporters and detractors within and outside the government. If one adds to this mix, the power of the trade unions, and the need to maintain political expediency, it seems to us that this approach might be the only possible approach in a country like India. It must also be noted that at the current time, India's telecom sector continues to grow at a tremendous pace, with between 7 and 8 million subscribers (mostly wireless) added per month. This growth continues to provide opportunities for local as well as lure more foreign players to the arena, which continues to increase the technology while decreasing the costs to the end customer.

Future research in this area could focus on recommendations for the dispensing of 3G spectrum to cellular operators, a study on the quality of services provided, and studies on rural transformation as a result of the spread of rural telecommunications in India.

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