CHAPTER 1

Introduction

1.1 Telecommunication Industry in India

The Indian telecommunication industry is the world's fastest growing industry with 851.70 million mobile phone subscribers as of June 2011. It is also the second largest telecommunication network in the world in terms of number of wireless connections after China.

As the fastest growing telecommunications industry in the world, it is projected that India will have 1.159 billion mobile subscribers by 2013. Furthermore, projections by several leading global consultancies indicate that the total number of subscribers in India will exceed the total subscriber count in China by 2013. The industry is expected to reach a size of ₹344,921 crore (US$76.92 billion) by 2012 at a growth rate of over 26 per cent, and generate employment opportunities for about 10 million people during the same period. According to analysts, the sector would create direct employment for 2.8 million people and for 7 million indirectly. In 2008-09 the overall telecom equipments revenue in India stood at ₹136,833 crore (US$30.51 billion) during the fiscal, as against ₹115,382 crore (US$25.73 billion) a year before. A number of factors have been responsible for the amazing growth in India’s telecom sector; apart from the obvious booming economy and the rapid expansion in the country’s middle class, the growth drivers include low tariffs, low

3. "Indian telecommunications industry is one of the fastest growing in the world". IBEF. Retrieved February 2010.
9. "Indian telecommunications industry is one of the fastest growing in the world". IBEF. Retrieved February 2010.
handset prices and most notably a highly competitive market created by the government and the regulator.\[12\]

The government has continued to open the market up to more and more competition. Home to a clutch of global operators working with local companies, the government has continued to issue licences to new telecom operators. Competition in the market place has become even more intense over the last year or so. The launch of Mobile Number Portability (MNP) in 2011 added yet another dimension to this intensely competitive market.

It is interesting to note, today India has the second largest telecommunication network in the world in terms of Mobile phones in use.

List of countries by number of mobile phones in use\[5\]

Table No.1

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country or region</th>
<th>Number of mobile phones</th>
<th>Population</th>
<th>% of population</th>
<th>Last updated</th>
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<td>-</td>
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<td></td>
<td>2010[2]</td>
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<td>672,180</td>
<td>192.53</td>
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</table>

For the past decade or so, telecommunication activities have gained momentum in India. Efforts have been made from both governmental and non-governmental platforms to enhance the infrastructure. The idea was to help modern telecommunication technology penetrate India’s socio-culturally diverse society, and to transform it into a nation of technology aware people.

A large population, low telephony penetration levels, and rise in customer income and spend owing to strong economic growth have contributed to making India the fastest-growing telecom market in the world. The first and largest operator is the state-owned incumbent BSNL, which is also the 7th largest telecom company in world in terms of number of subscribers. BSNL was created by corporatisation of the erstwhile DTS (Department of Telecommunication Services), a government unit responsible for provision of telephony services. Subsequently, after the telecommunication policy was revised to allow private operators, companies such as Bharti Telecom, Tata Indicom, Vodafone, MTNL, have entered the space.
1.2 Global Telecommunication – Past- Present & Future

1.2.1 Emergence of Telephones in the world

"An instrument that converts voice and other sound signals into a form that can be transmitted to remote locations and that receives and reconverts waves into sound signals." The word telephone is derived from the Greek language. The word tele, meaning afar, and phone, meaning voice.

Many inventors had brainstormed the idea of a telephone. In 1627 Francis Bacon actually described a working telephone in his book *New Utopia*. However this idea was unfathomable at the time. Like Leonardo Da Vinci and Jules Verne, Bacon was way ahead of his time for this invention. There was simply not enough knowledge about transmitting electric currents, and no set infrastructure to make the telephone a reality.

Like many inventions, the telephone was invented over the course of several years. The three major players involved in the development of the telephone are Alexander Gram Bell, Thomas Watson and Elisha Gray. However, only Alexander Gram Bell is credited with the actual development of the phone.

Both Alexander Gram Bell, and Elisha Gray rushed their ideas to the patent office to try and beat the other. Literally their applications showed up at the patent office within hours of each other. Bell was the first to reach the patent office and as a result is credited with the development of the telephone. Endless law suits between Bell and Gray continued over who was the rightful inventor of the telephone, and who owned and developed that technology.

1.3 History of the Telephone

The history of the telephone dates back to Bell’s research, which began around 1870. Initially he was working on ways to improve the telegraph, which had been used for over 30 years. At the time the telegraph was the primary form of long distance communication. It was the most reliable and accurate way to quickly transmit information. The telegraph used the Morse code system, which consisted of a series of dots and dashes. Morse code was effective, but limited conversations to one person
sending or receiving at a time. Differing from the telephones we use today, where both
users can talk at the same time, or interrupt one another.

1.3.1 The Harmonic Telegraph

The idea of a multiple telegraph had been brainstormed, but not actually built. A
multiple telegraph would enable multiple messages to be sent through the same line, as
long as the pitches of the signals were different. Bell had brainstormed this idea and
began working on it. He called his version of the multiple telegraphs the harmonic
telegraph. For several years he continued to develop a functioning harmonic telegraph.

In 1874 Bell had begun to make significant improvements on his harmonic telegraph,
however lacked the financial backing to continue his research. He reached out to his, at
the time, future father in law. Famous Boston attorney Gardiner Greene Hubbard.
Hubbard was a well-known and respected lawyer. He had great resentment for Western
Union Telegraph Company because of the monopoly it had over the telegraph industry.
Bell knew that his technology would rival Western Union Telegraph Company making
Hubbard a sound investor. Teaming up with George Sanders, a well-known and
respected businessman from Salem, Sanders and Hubbard foresaw the potential profits
and success the harmonic telegraph could provide. Sanders researched patents and
found out there was no patent on a multiple telegraph or anything similar. Realizing the
market potential, Sanders and Hubbard agreed to provide the financial backing.
Hubbard was personally involved with this project because he saw the invention of the
harmonic telegraph as way to compete and destroy the Western Union Telegraph
Company.

In 1875 Bell hired Thomas Watson to assist him in his research. Watson was an
experienced machinist and would provide great insight and help towards the
development of the harmonic telegraph. Bell and Hubbard continued to work on the
telegraph, but by this time, Bell’s investors Hubbard and Sanders had seen Bell’s
insight towards the telephone and were more interested in seeing the idea become a
reality.

On March 1, 1875, Bell decided again he needs to seek outside help for his invention.
He travelled down to Washington DC where he met with famous inventor and
secretary of the Smithsonian Institution, Joseph Henry. Henry was fascinated by Bell’s idea of the telephone and said; transferring speech electronically was the "germ of a great invention." Bell agreed, and expressed his lack of electrical knowledge as a major milestone to the development, Henry simply replied, "Get it!" Meaning doesn’t let your lack of electrical knowledge stop you from inventing something great.

Upon returning to Boston Bell had been inspired by Henry and focused most of his energy on developing the telephone; yet never let his idea of the harmonic telegraph die.

June 2, 1875, marked an important day for the development of the telephone. In efforts to test the harmonic telegraph, Bell again found it was not working. Instead of hearing silence, Bell heard the sound of Watson plucking a tuned spring. Confused and mesmerized by this recent discovery, Bell had accidentally created the first prototype telephone. Usually on a telegraph machine the current is either turned on or off, sending either silence or a beep. After studying their equipment Bell discovered that a contact screw was accidentally screwed too tight; causing the current to run continuously.

Understanding their recent discoveries, Bell had Watson develop the first telephone, which was later named the Gallows telephone. Named for its unique structure and use of a diaphragm rather than a spring. To their surprise the Gallows phone did not work. There was distortion in the line, and sounds coming through, but not speech.

1.3.2 Development of the Telephone

On February 14, 1876 Bell, had not yet developed a working telephone but felt he could describe how the phone would work and applied for a patent. In 1870, the patent office had just ruled that inventors did not need to have a working invention to get a patent. Explaining how it would work, was cause enough for a patent. Coincidentally Bell’s request for a patent came only hours before Elisha Gray’s. Elisha Gray was another inventor who had been working on the development of the telephone. No one really knows how or why both patents were filed on the same day, but some think Bell was told of Gray’s invention, however this theory was never proven. Over 600 lawsuits followed challenging the rightful owner of the patent on the telephone.
On March 10, 1876 Bell had developed the telephone. He used a liquid transmitter, an idea that he had never experimented before or placed in his patent. It was the idea that Gray had patented, and the cause of many lawsuits about to come.

Technology for the telephone continued to develop, while simultaneously a new industry had spun off, the telecom industry. Related technology was developed as a result of this invention, as well as an entire telephone system was deployed throughout the world.

1.3.4 Telephones Today

Today our telecom infrastructure has far surpassed the dream of Alexander Gram Bell and Thomas Watson. Calling to your neighbours, or the other side of the world is easy, affordable and possible from almost every house across America. The telecom industry has exploded with all different types of products making calling easier and cheaper. Today we have the telecom industry, which relies around Bell’s invention of the 1870’s. Common telecom products include prepaid phone cards, broadband phone systems, cell phones and more.

Bell’s patent from the United States Patent Office, number 174,465 is often considered the most important patent ever issued. It has enabled global communication and continued to help the process of globalization

1.4 Emergence of Cellular Phones in the World

The beginning history of cell phones is based upon radio technology that was developed from the 1940's onward. For instance the beginning of cell phones can be traced to the innovation in taxi cabs, police cars and other service vehicles where two way radios were used to communicate with one another or with a central base. Early cell phone communication technology could be even traced back to individuals with special radios that can patch into a phone line via live operator to make a phone call.

The first official mobile phone was used in Sweden by the Swedish police in 1946. The technology was connected to the telephone network and was distinctive of two way radio technology. The phone was not very practical; it was only able to make 6 phone calls before the car's battery was drained.
The technology of modern cell phones started with the creation of hexagonal cells for mobile phones by D.H. Ring from Bell Labs in 1947, later on another engineer from Bell Labs conceived of cell towers that would transmit and receive signals in three directions instead of normal bi-directional antennas. However, although some technologies have been developed, electronics and other technologies would take decades to mature and to be developed. For instance, the electronics that were used in the first cell phones were first developed in the 1960's.

By 1967, mobile phone technology was available; however, the user had to stay within one cell area. Cell areas which were serviced by a base station were unable to hand off cellular phone calls from one base station to another. While you could make a phone call, you weren't able to continue the call after you reached a set range. In 1970, Amos Edward Joel, who also was an engineer at Bell Labs, developed the call handoff system. This technology facilitated continuity of a phone call from one area to another without dropping the phone call.

While the technology had been developed, it wasn't until 1971 that AT&T submitted a request to the FCC for cellular service. It took more than 10 years for an approval and in 1982; the FCC allocated the frequencies of 824-894 MHZ Band to Advanced Mobile Phone Service (AMPS). From 1982 to 1990, AMPS was an analog service, Digital AMPS came online as of 1990.

Throughout the decades, there have been many technologies that existed that made mobile phones available. Most of the time, these phones were installed in vehicles due to the large battery requirements. For instance, the MTA (Mobile Telephone System A) developed by Eriksson was available in Sweden in 1950's. Unfortunately, it weighed over 80 pounds, later versions however weighed around the 20 pound range, still making it ineffective for truly portable devices that are used today.

1.4.1 First Generation Cell Phones

In 1983, Motorola unveiled to the world, the first truly portable cellular phone. It was called the Motorola DynaTAC 8000X. It was approved for use in the United States by the FCC. Motorola developed the technology for cellular phones for decades and this particular phone took 15 years to come to market at an expense of over 100 million
dollars in research costs. The DynaTAC800X was extremely lightweight for its time and only weighed about 28 ounces. It was 13 inches x 1.75 inches x 3.5 inches and was known as the Brick for its shape. It was largely developed with the help of Dr. Martin Cooper of Motorola.

From 1983 to the end of the 1980's cell phones grew in popularity due to the innovations in cellular networks that were able to handle phone calls in either one area or hand them off to other areas. While most cell phones weren't made to be carried in your hand, all phones were made for permanent installation in the car. For a while the term "car phone" was extremely popular. Besides car phones, there were a few models that came in tote bag type configurations that can easily hook up to a car's battery, via the DC outlet to make calls. There were also a few models that came as briefcases, to hold large batteries necessary to make phone calls.

1.4.2 Second Generation Cellular Phones

Cellular phones from the early 1990's are considered being second generation (2G) and they were able to work on mobile phone systems such as GSM, IS-136 (TDMA) and IS-95 (CDMA). Digital mobile phone networks were in use in the United States in 1990 and in Europe by 1991. 2G mobile phones use digital circuit switched transmissions. This ultimately enabled quicker network signalling, lowering the amount of dropped calls and increasing call quality. As 2G digital networks were online, most of the time, they replaced analog network frequencies, effectively making them obsolete.

Phones based on 2G technology were much smaller than the brick telephones of the mid to late 80's. Most 2G cellular phones were usually in the range of 100 to 200 grams, plus they were hand held devices that were truly portable without the need for a large battery. Advances in battery technology, as well as computer chip technology also helped to make 2G cell phones much smaller than their predecessors. With these innovations, cell phone usage soared.
1.4.3 Third Generation Cellular Phones

Third Generation cellular phones is the technology that is currently available today and it is commonly referred to as 3G. While 3G came only a few years after 2G, mainly due to many innovations in technology and services, standards for 3G are usually different depending on the network.

It is usually stated that 3G is not necessarily a rigid standard, but is a set of requirements that most networks and cell phone providers follow. There are two main requirements; they include 2 Megabits of maximum data rate indoors and 384 kbits for outdoor use. 3G mobile phones usually include innovations to receive much more than phone calls, for instance, SMS text is available and some 3G phones also offer email and Internet access. Currently technologies are continuing to improve and new innovations such as streaming radio and TV, as well as Wifi are currently breaking into the market.

1.5 Indian Telecommunication – Past- Present & Future

The Republic of India possesses a diversified communications system that links all parts of the country by Internet, telephone, telegraph, radio, and television. None of the telecommunications forms are as prevalent or as advanced as those in modern Western countries, but the system includes some of the most sophisticated technology in the world and constitutes a foundation for further development of a modern network. Indian telecommunication industry is the world's second-largest in terms of number of subscribers, and the world's fastest growing market in terms of number of new subscribers.\(^1\)[2][3][4] India had 851.70 million mobile phone subscribers at the end of June 2011.\(^5\)

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3. ^"Indian telecommunications industry is one of the fastest growing in the world" (doc). IBEF. Retrieved February 2010.
The country has third highest number of Internet users as of December 2010.[6] The primary regulator of communications in India is the Telecom Regulatory Authority of India. It closely regulates all of the industries mentioned below with the exception of newspapers and the Internet service provider industry.

As the fastest growing telecommunications market in the world, India is projected to have 1.159 billion mobile subscribers by 2013.[7][8][9][10] Several leading global consultancies estimate that India will become the world's largest mobile phone market by subscriptions by 2013.[7][8] The industry is expected to reach a size of ₹344,921 crore (US$76.92 billion) by 2012 at a growth rate of over 26 per cent, and generate employment opportunities for about 10 million people during the same period.[11] According to analysts, the sector would create direct employment for 2.8 million people and for 7 million indirectly.[11] In 2008-09 the overall telecom equipments revenue in India stood at ₹136,833 crore (US$30.51 billion) during the fiscal, as against ₹ 115,382 crore (US$25.73 billion) a year before.[12]

1.6 Winds of Change: Telecom growth in India

A large population, low telephony penetration levels, and a rise in customer spending power has helped make India the fastest-growing telecom market in the world. The market's first operator was the state-owned Bharat Sanchar Nigam Limited (BSNL), created by corporatization of the Indian Telecommunication Service, a government unit formerly responsible for provision of telephony services. Subsequently, after the telecommunication policies were revised to allow private operators, companies such as Bharti Airtel, Reliance Communications, Tata Teleservices, Idea Cellular, Aircel and Loop Mobile have entered the market (Bharti Airtel currently being the largest telecom company in India).

9. "Indian telecommunications industry is one of the fastest growing in the world" (doc). IBEF. Retrieved February 2010.
In the fiscal year 2008-09, rural India outpaced urban India in mobile growth rate. The total number of telephones in the country stands at 885.99 million, while the overall tele-density has increased to 73.97% as of June 30, 2011.\textsuperscript{[5]} Mobile telephony experiences growths at rates such as 11.41 million subscribers a month, which were added in June 2011.\textsuperscript{[5]}

1.6.1 History Telecom in India

Telecom in the real sense means the transfer of information between two distant points in space. The popular meaning of telecom always involves electrical signals and as a result, people often exclude postal or any other raw telecommunication methods from its meaning. Therefore, the history of Indian telecom can be started with the introduction of telegraph.

1.6.2 Emergence of the telegraph in India

The Indian postal and telecom sectors saw a slow and uneasy start. In 1850, the first experimental electric telegraph line was started between Kolkata and Diamond Harbor. In 1851, it was opened for the use of the British East India Company. The Posts and Telegraphs department occupied a small corner of the Public Works Department,\textsuperscript{[13]} at that time.

Subsequently, the construction of 4,000 miles (6,400 km) of telegraph lines connecting Kolkata (then Calcutta) and Peshawar in the north along with Agra, Mumbai (then Bombay) through Sindwa Ghats, and Chennai (then Madras) in the south, as well as Ootacamund and Bangalore was started in November 1853. Dr. William O'Shaughnessy, who pioneered the telegraph and telephone in India, belonged to the Public Works Department, and worked towards the development of telecom throughout this period. A separate department was opened in 1854 when telegraph facilities were opened to the public.

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\textsuperscript{[13]} India will overtake China as world's largest mobile market in 2013*, informa telecoms & media.
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1.6.3 Emergence of telephones in India

First Telephone in India or First call in India is having long history i.e. more than 125 Years which we will try to explore here. Alexander Graham Bell patented the first Telephone instrument capable of practical use in 1876. This method was used in the first commercial instrument developed by Bell in 1876. In 1878, the first telephone exchange was established at New Haven In 1880, two telephone companies namely The Oriental Telephone Company Ltd. and The Anglo-Indian Telephone Company Ltd. approached the Government of India to establish telephone exchanges in India. The permission was refused on the grounds that the establishment of telephones was a Government monopoly and that the Government itself would undertake the work.

In 1881, the Government later reversed its earlier decision and a licence was granted to the Oriental Telephone Company Limited of England for opening telephone exchanges at Calcutta, Bombay, Madras and Ahmedabad and the first formal telephone service was established in the country.[14]

On the 28th January 1882, Major E. Baring, Member of the Governor General of India's Council declared open the Telephone Exchanges in Calcutta, Bombay and Madras. The exchange in Calcutta named the "Central Exchange", was opened at third floor of the building at 7, Council House Street, with a total of 93 subscribers. Later that year, Bombay also witnessed the opening of a telephone exchange.

From the year 1902 India drastically changes from cable telegraph to wireless telegraph, radio telegraph, radio telephone, trunk dialling. Trunk dialling used in India for more than a decade, were system allowed subscribers to dial calls with operator assistance. Later on moved to, digital microwave, optical fibre, satellite earth station etc. During British period all major cities and towns in India were linked with telephones.

1.6.4 Emergence of Wireless Communication in India

Pager Services

Pager communication was successfully launched in India in the year 1995. Pagers were looked upon as devices that offered the much needed mobility in communication, especially for businesses. Motorola was a major player with nearly 80 per cent of the market share. The other companies included Mobilink, Pagelink, BPL, Usha Martin telecom and Easy call. Pagers were generally worn on the belt or carried in the pocket.

The business peaked in 1998 with the subscriber base reaching nearly 2 million. However, the number dropped to less than 500,000 in 2002. The pager companies in India were soon struggling to maintain their business. While 2-way pagers could have buffered the fall, the pager companies were not in a position to upgrade their infrastructure to improve the ailing market. The Indian Paging Services Association was unable to support the industry.

Pager companies in India also offered their services in regional languages also. However, the end had begun already. By 2002, Motorola stops making or servicing pagers. When mobile phones were commercially launched in India, the pager had many advantages to boast. Pagers were smaller, had a longer battery life and were considerably cheaper. However, the mobile phones got better with time and continuously upgraded themselves.

1.7 Emergence of Mobile Communication in India

First mobile telephone service on non-commercial basis was started in India on 48th Independence Day at country’s capital Delhi. The first cellular call was made in India on July 31st, 1995 over Modi Telstra’s Mobile Net GSM network of Kolkata. Later mobile telephone services are divided into multiple zones known as circles. Competition has caused prices to drop and calls across India are one of the cheapest in the world.

Most of operator follows GSM mobile system operate under 900MHz bandwidth few recent players started operating under 1800MHz bandwidth. CDMA operators operate under 800Mhz band, they are first to introduce EVDO based high speed wireless data
services via USB dongle. In spite of this huge growth Indian telecom sector is hit by severe spectrum crunch, corruption by India Govt. officials and financial troubles.

In 2008, India entered the 3G arena with the launch of 3G enabled Mobile and Data services by Government owned MTNL and BSNL. Later from November 2010 private operator’s started to launch their services.

1.7.1 Indian telecom: Milestones and developments at a glance

- Pre-1902 - Cable telegraph
- 1902 - First wireless telegraph station established between Sagar Islands and Sandheads.
- 1907 - First Central Battery of telephones introduced in Kanpur.
- 1913-1914 - First Automatic Exchange installed in Shimla.
- 1927 - Radio-telegraph system between the UK and India, with Imperial Wireless Chain beam stations at Khadki and Daund. Inaugurated by Lord Irwin on 23 July by exchanging greetings with King George V.
- 1933 - Radiotelephone system inaugurated between the UK and India.
- 1953 - 12 channel carrier system introduced.
- 1960 - First subscriber trunk dialing route commissioned between Lucknow and Kanpur.
- 1975 - First PCM system commissioned between Mumbai City and Andheri telephone exchanges.
- 1976 - First digital microwave junction introduced.
- 1979 - First optical fibre system for local junction commissioned at Pune.
- 1980 - First satellite earth station for domestic communications established at Sikandarabad, U.P..
- 1983 - First analog Stored Program Control exchange for trunk lines commissioned at Mumbai.
- 1984 - C-DOT established for indigenous development and production of digital exchanges.
- 1995 - First mobile telephone service started on non-commercial basis on 15 August 1995 in Delhi.
• 1995 - Internet Introduced in India starting with Delhi, Bombay, Calcutta, Chennai and Pune on 15 August 1995

While all the major cities and towns in the country were linked with telephones during the British period, the total number of telephones in 1948 numbered only around 80,000. Post independence, growth remained slow because the telephone was seen more as a status symbol rather than being an instrument of utility. The number of telephones grew leisurely to 980,000 in 1971, 2.15 million in 1981 and 5.07 million in 1991, the year economic reforms were initiated in the country.

While certain measures were taken to boost the telecom industry from time to time, (for example introduction of the telex service in Mumbai in 1953 and commissioning of the first Subscriber trunk diailling route between Delhi and Kanpur and between Lucknow and Kanpur in 1960), the first waves of change were set going by Sam Pitroda in the eighties.\[15\] The real transformation in scenario came with the announcement of the National Telecom Policy in 1994.\[16\]

1.7.2 Indian telecom sector: transient policies

• All villages shall receive telecom facilities by the end of 2002.
• A Communication Convergence Bill introduced in the Parliament on August 31, 2001 is presently before the Standing Committee of Parliament on Telecom and IT.
• National Long Distance Service (NLD) is opened for unrestricted entry.
• The International Long Distance Services (ILDS) have been opened to competition.
• The basic services are open to competition.
• In addition to the existing three, a fourth cellular operator, one each in four metros and thirteen circles, has been permitted. Cellular operators have been permitted to provide all types of mobile services including voice and non-voice messages, data services and PCOs utilizing any type of network equipment, including circuit and/or package switches that meet certain required standards.

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- Policies allowing private participation have been announced as per the New Telecom Policy (NTP), 1999 in several new services, which include Global Mobile Personal Communication by Satellite (GMPCS) Service, digital Public Mobile Radio Trunked Service (PMRTS) and Voice Mail/ Audiotex/ Unified Messaging Services.
- Wireless Local Loop (WLL) has been introduced to provide telephone connections in urban, semi-urban and rural areas promptly.
- Two telecom PSUs, VSNL and HTL have been disinvested.
- Steps are being taken to fulfil Universal Service Obligation (USO), funding, and administration.
- A decision to permit Community Phone Service has been announced.
- Multiple Fixed Service Providers (FSPs) licensing guidelines were announced.
- Internet Service Providers (ISPs) have been allowed to set up International Internet Gateways, both Satellite and Landing stations for submarine optical fibre cables.
- Two categories of infrastructure providers have been allowed to provide end-to-end bandwidth and dark fiber, right of way, towers, duct space etc.
- Guidelines have been issued by the Government to open up Internet telephony (IP).
- Asd Cellular Phones in India

1.8 **Emergence Bharat Sanchar Nigam Limited (BSNL)**

In 1975, the Department of Telecom (DoT) was separated from Indian Post & Telecommunication Accounts and Finance Service. DoT was responsible for telecom services in entire country until 1985 when Mahanagar Telephone Nigam Limited (MTNL) was carved out of DoT to run the telecom services of Delhi and Mumbai. In 1990s the telecom sector was opened up by the Government for private investment as a part of Liberalisation-Privatization-Globalization policy. Therefore, it became necessary to separate the Government's policy wing from its operations wing. The Government of India corporatised the operations wing of DoT on 1 October 2000 and named it as Bharat Sanchar Nigam Limited (BSNL).

1.8.1 **Privatization of telecommunications in India**

The Indian government was composed of many factions (parties) which had different ideologies. Some of them were willing to throw open the market to foreign players (the centrists) and others wanted the government to regulate infrastructure and restrict the involvement of foreign players. Due to this political background it was very difficult to bring about liberalization in telecommunications. When a bill was in parliament a
majority vote had to be passed, and such a majority was difficult to obtain, given to the number of parties having different ideologies.

Liberalization started in 1981 when Prime Minister Indira Gandhi signed contracts with Alcatel CIT of France to merge with the state owned Telecom Company (ITI), in an effort to set up 5,000,000 lines per year. But soon the policy was let down because of political opposition. She invited Sam Pitroda a US based Non-resident Indian NRI to set up a Centre for Development of Telematics (C-DOT), however the plan failed due to political reasons. During this period, after the assassination of Indira Gandhi, under the leadership of Rajiv Gandhi, many public sector organizations were set up like the Department of Telecommunications (DoT), VSNL and MTNL. Many technological developments took place in this regime but still foreign players were not allowed to participate in the telecommunications business.[17]

The demand for telephones was ever increasing. It was during this period that the Narsimha Rao-led government introduced the national telecommunications policy [NTP] in 1994 which brought changes in the following areas: ownership, service and regulation of telecommunications infrastructure. They were also successful in establishing joint ventures between state owned telecom companies and international players. But still complete ownership of facilities was restricted only to the government owned organizations. Foreign firms were eligible to 49% of the total stake. The multinationals were just involved in technology transfer, and not policy making.[17]

During this period, the World Bank and ITU had advised the Indian Government to liberalize long distance services in order to release the monopoly of the state owned DoT and VSNL; and to enable competition in the long distance carrier business which would help reduce tariffs and better the economy of the country. The Rao run government instead liberalized the local services, taking the opposite political parties into confidence and assuring foreign involvement in the long distance business after 5 years. The country was divided into 20 telecommunication circles for basic telephony and 18 circles for mobile services. These circles were divided into category A, B and C depending on the value of the revenue in each circle.

The government threw open the bids to one private company per circle along with government owned DoT per circle. For cellular service two service providers were allowed per circle and a 15 years license was given to each provider. During all these improvements, the government did face oppositions from ITI, DoT, MTNL, VSNL and other labor unions, but they managed to keep away from all the hurdles.\[^{17}\]

After 1995 the government set up TRAI (Telecom Regulatory Authority of India) which reduced the interference of Government in deciding tariffs and policy making. The DoT opposed this. The political powers changed in 1999 and the new government under the leadership of Atal Bihari Vajpayee was more pro-reforms and introduced better liberalization policies. They split DoT in two- one policy maker and the other service provider (DTS) which was later renamed as BSNL. The proposal of raising the stake of foreign investors from 49% to 74% was rejected by the opposite political party and leftist thinkers. Domestic business groups wanted the government to privatize VSNL. Finally in April 2002, the government decided to cut its stake of 53% to 26% in VSNL and to throw it open for sale to private enterprises. TATA finally took 25% stake in VSNL.\[^{17}\]

This was a gateway to many foreign investors to get entry into the Indian Telecom Markets. After March 2000, the government became more liberal in making policies and issuing licenses to private operators.

The government further reduced license fees for cellular service providers and increased the allowable stake to 74% for foreign companies. Because of all these factors, the service fees finally reduced and the call costs were cut greatly enabling every common middle class family in India to afford a cell phone. Nearly 32 million handsets were sold in India. The data reveals the real potential for growth of the Indian mobile market.\[^{18}\]

In March 2008 the total GSM and CDMA mobile subscriber base in the country was 375 million, which represented a nearly 50% growth when compared with previous year.\[^{19}\]


\[^{19}\] "Public Works Department". Pwd.delhigovt.nic.in. Retrieved 2010-09-01.
As the unbranded Chinese cell phones which do not have International Mobile Equipment Identity (IMEI) numbers pose a serious security risk to the country, Mobile network operators therefore planned to suspend the usage of around 30 million mobile phones (about 8% of all mobiles in the country) by 30 April.\(^\text{20}\) 5–6 years the average monthly subscribers additions were around 0.05 to 0.1 million only and the total mobile subscribers base in December 2002 stood at 10.5 millions. However, after a number of proactive initiatives were taken by regulators and licensors, the total number of mobile subscribers has increased greatly to 851.70 million subscribers as of June 30th 2011.\(^\text{5}\)

India has opted for the use of both the GSM (global system for mobile communications) and CDMA (code-division multiple access) technologies in the mobile sector. In addition to landline and mobile phones, some of the companies also provide the WLL service. The mobile tariffs in India have also become lowest in the world. A new mobile connection can be activated with a monthly commitment of US$0.15 only. In 2005 alone additions increased to around 2 million per month in the year 2003-04 and 2004-05.

In June 2009, the Government of India banned the import of several mobile phones manufactured in China citing concerns over quality and the lack of IMEI's which make it difficult for authorities in India to track the sale and use of such phones.\(^\text{21}\) In April 2010, the Government was also reported to be blocking Indian service providers from purchasing Chinese mobile technology citing concerns that Chinese hackers could compromise the Indian telecommunications network during times of national emergency. A series of attacks on Indian government websites and computer networks by suspected Chinese hackers has also made Indian regulators suspicious with regards to the import of potentially sensitive equipment from China. The companies reported to be affected by this are Huawei Technologies and ZTE.\(^\text{22}\)[\(\text{23}\)][\(\text{24}\)  

\(^{5}\) Telecom Regulatory Authority of India (8 Aug 2011).
\(^{22}\) "Indian Government". Dot.gov.in. Retrieved 2010-09-01.
\(^{23}\) "Draft Information Paper on Dial-up Internet Access" (PDF). Retrieved 2010-09-01.
1.9 Telecommunications Regulatory Environment in India

LIRNEasia's Telecommunications Regulatory Environment (TRE) index, which summarizes stakeholders’ perception on certain TRE dimensions, provides insight into how conducive the environment is for further development and progress. The most recent survey was conducted in July 2008 in eight Asian countries, including Bangladesh, India, Indonesia, Sri Lanka, Maldives, Pakistan, Thailand, and the Philippines. The tool measured seven dimensions: i) market entry; ii) access to scarce resources; iii) interconnection; iv) tariff regulation; v) anti-competitive practices; and vi) universal services; vii) quality of service, for the fixed, mobile and broadband sectors.

The results for India, point out to the fact that the stakeholders perceive the TRE to be most conducive for the mobile sector followed by fixed and then broadband. Other than for Access to Scarce Resources the fixed sector lags behind the mobile sector. The fixed and mobile sectors have the highest scores for Tariff Regulation. Market entry also scores well for the mobile sector as competition is well entrenched with most of the circles with 4-5 mobile service providers. The broadband sector has the lowest score in the aggregate. The low penetration of broadband of mere 3.87 against the policy objective of 9 million at then end of 2007 clearly indicates that the regulatory environment is not very conducive.\[25\]

1.9.1 Cellular phones: The current Revenue and growth

The total revenue in the telecom service sector was ₹86,720 crore (US$19.3 billion) in 2005-06 as against ₹71,674 crore (US$16 billion) in 2004-2005, registering a growth of 21%. estimated revenue of FY'2011 is Rs.835 crore (US$ 19 Bn Approx). The total investment in the telecom services sector reached ₹200,660 crore (US$44.7 billion) in 2005-06, up from ₹178,831 crore (US$39.9 billion) in the previous fiscal.\[26\] Telecommunication is the lifeline of the rapidly growing Information Technology industry. Internet subscriber base has risen to more than a 100 million in 2010.\[27\]

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26. ^ [dead link]
Out of this 11.47 million were broadband connections.[5] More than a billion people use the Internet globally. Under the Bharat Nirman Programme, the Government of India will ensure that 66,822 revenue villages in the country, which have not yet been provided with a Village Public Telephone (VPT), will be connected. However doubts have been raised about what it would mean for the poor in the country.[28]

It is difficult to ascertain fully the employment potential of the telecom sector but the enormity of the opportunities can be gauged from the fact that there were 3.7 million Public Call Offices in December 2005[29] up from 2.3 million in December 2004.

The Total Revenue of Indian Telecom Services company is likely to exceed Rs 200000 Cr (US$ 44 Bn approx) for FY 11-12 based on FY 10-11 nos and latest quarterly results. These are consolidated nos including foreign operation of Bharti Airtel. The major contributions to this revenue are as follows: Bharti Airtel 65,060 Reliance Comm 31,468 Idea Cellular 16,936 Tata Comm 11,931 MTNL 4,380 TTML 2,248 BSNL 32,045 Voda 18,376 TataTeleService 9,200 Aircel 7,968 SSTL 600 Uninor 660 Loop 560 Stel 60 HFCL 204 Videocon Telecom 254 DB Etisalat/ Allianz 47 Grand Total Rs 201,997 Crs contributed by Sanjay Banka, FCA

1.9.2 Telephones: the current scenario

On landlines, intra-circle calls are considered local calls while inter-circle are considered long distance calls. Currently Government is working to integrate the whole country in one telecom circle. For long distance calls, the area code prefixed with a zero is dialled first which is then followed by the number (i.e. to call Delhi, 011 would be dialled first followed by the phone number).

For international calls, "00" must be dialled first followed by the country code, area code and local phone number. The country code for India is 91.

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1.9.3 Cellular phones: the current scenario

Telephone Subscribers (Wireless and Landline): 885.99 million (June 2011)[5]
Land Lines: 34.29 million (June 2011)[5]
Cell phones: 851.70 million (June 2011)[5]
Monthly Cell phone Addition: 11.41 million (June 2011)[5]
Teledensity: 73.97 % (June 2011)[5]

**Projected Teledensity: 1 billion,= 84% of population by 2012.**[30]

With a subscriber base of more than 851 million,[5] the Mobile telecommunications system in India is the second largest in the world and it was thrown open to private players in the 1990s. The country is divided into multiple zones, called circles (roughly along state boundaries). Government and several private players run local and long distance telephone services. Competition has caused prices to drop and calls across India are one of the cheapest in the world.[31] The rates are supposed to go down further with new measures to be taken by the Information Ministry.[32] In September 2004, the number of mobile phone connections crossed the number of fixed-line connections and presently dwarfs the wireline segment by a ratio of around 20:1.[5] The mobile subscriber base has grown by a factor of over a hundred and thirty, from 5 million subscribers in 2001 to over 851 million subscribers as of June 2011 [5] (a period of 10 years) . India primarily follows the GSM mobile system, in the 900 MHz band. Recent operators also operate in the 1800 MHz band. The dominant players are Airtel, Reliance Infocomm, Vodafone, Idea cellular and BSNL/MTNL. There are many smaller players, with operations in only a few states. International roaming agreements exist between most operators and many foreign carriers.

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5. ^ a b c d e f g h i j k l m n o p q r s t u v w x y z Telecom Regulatory Authority of India (8 Aug 2011). “Highlights of Telecom Subscription Data as on 30th June 2011” (PDF). Press release. Retrieved 9 Aug 2011.
32. ^ Press Release no. 60/2006 issued on 28 June 2006 by TRAI
1.10 Cellular Phone services in India today

Cellular services are a part of the telecommunication sector of India. It was launched in 1999 with the adoption of New National Telecom Policy by Telecom regulatory authority of India (TRAI). Cellular services are further divided into two categories, namely GSM (Global System for Mobile Communications) and CDMA (Code Division Multiple Access). GSM segment consists of players like Airtel, Vodafone, Idea and BSNL. Whereas, CDMA segment consists of players like Reliance, Tata, etc. There are five private service operators in each area, and an incumbent state operator. Cellular companies provide two types of subscriptions – pre-paid and post-paid. Almost 80% of the cellular subscriber base belongs to the pre-paid segment. The DoT has allowed cellular companies to buy rivals within the same operating circle provided their combined market share did not exceed 67 per cent. Previously, they were only allowed to buy companies outside their circle.

1.10.1 The Market Players

Some of the major cellular providers operating at national level are BSNL’s ‘CellOne’, Airtel, Reliance, Tata Indicom and Hutch. Reliance and Tata Indicom operate on CDMA technology and others on GSM. Apart from these, there are regional GSM operators like Spice in Karnataka, Aircel in Tamilnadu, MTNL’s Dolphin in Mumbai and Idea in North India etc.

Airtel: “Bharti Airtel” formerly known as Bharti Tele-Ventures Limited (BTVL) is among India's largest mobile phone and Fixed Network operators. With more than 60 million subscriptions as of 13th February 2008, it offers its mobile services under the Airtel brand. The company also provides telephone services and Internet access over DSL in 14 circles. The company complements its mobile, broadband & telephone services with national and international long distance services. The company also has a submarine cable landing station at Chennai, which connects the submarine cable connecting Chennai and Singapore. The company provides reliable end-to-end data and enterprise services to the corporate customers by leveraging its nationwide fiber optic backbone, last mile connectivity in fixed-line and mobile circles, VSATs, ISP and international bandwidth access through the gateways and landing station.

In April 2006 Bharti Global Limited was awarded a telecommunications license in Jersey in the Channel Islands by the local telecommunications regulator the JCRA. In September 2006 the Office of Utility Regulation in Guernsey awarded Guernsey Airtel with a mobile telecommunications license. In May 2007 Jersey Airtel and Guernsey Airtel announced the launch of a relationship with Vodafone for island mobile subscribers. In July 2007, Bharti Airtel signed an MoU with Nokia-Siemens for a 900 million dollar expansion of its mobile and fixed network. In August 2007, the company announced it will be launching a customized version of Google search engine that will provide an 'array of services' to its broadband customers.

**Vodafone:** is basically the biggest telecom service provider of the U.K. which has a market of £75 billions by June ’08. Vodafone currently has equity interests in 25 countries and Partner Networks (networks in which it has no equity stake) in a further 42 countries. The name Vodafone comes from Voice Data Fone, chosen by the company to “reflect the provision of voice and data services over mobile phones.” It had agreed to acquire a controlling interest of 67% in Hutchison Essar Ltd. (Hutch) for US$11.1 billion. At the same time, it agrees to sell back 5.6% of Airtel stake back to the Mittals. Vodafone retained 4.4% stake in Airtel. Vodafone is the world’s leading international mobile communications company. It now has operations in 25 countries across 5 continents and 40 partner networks with over 200 million customers worldwide. Vodafone has also tied up with Apple’s iphone. Vodafone’s revenues have been increased by 50% during the year driven by rapid expansion of the customer base with an average of 1.5 million net additions per month since acquisition. As on 31st March, 2008, Vodafone’s customer base was 260 millions. Its turnover was £35478 millions with a profit of £6756 million.

**Idea:** As India's leading GSM Mobile Services operator, IDEA Cellular has licenses to operate in 11 circles. With a customer base of over 17 million, IDEA Cellular has operations in Delhi, Maharashtra, Goa, Gujarat, Andhra Pradesh, Madhya Pradesh, Chattisgarh, Uttarakhand, Haryana, UP-West, Himachal Pradesh and Kerala.

As a leader in Value Added Services, Innovation is central to IDEA's VAS Factory. It is the first cellular company to launch music messaging with 'Cellular Jockey',
'Background Tones', 'Group Talk', a voice portal with 'Say IDEA' and a complete suite of Mobile Email Services.

Idea Cellular is a wireless telephony company operating in various states in India. It initially started in 1995 as a joint venture between the Tatas, Aditya Birla Group and AT&T by merging Tata Cellular and Birla AT&T Communications. Initially having a very limited footprint in the GSM arena, the acquisition of Escotel in 2004 gave Idea a truly pan-India presence covering Maharashtra (excluding Mumbai), Goa, Gujarat, Andhra Pradesh, Madhya Pradesh, Chattisgarh, Uttar Pradesh (East and West), Haryana, Kerala, Rajasthan and Delhi (inclusive of NCR).

The company has its retail outlets under the "Idea n' U" banner. The company has also been the first to offer flexible tariffs plans for prepaid customers. It also offers GPRS services in urban areas.

Holding: Initially the Birlas, the Tatas and AT&T Wireless each held one-third equity in the company. But following AT&T Wireless' merger with Cingular Wireless in 2004, Cingular decided to sell its 32.9% stake in Idea. This stake was bought by both the Tatas and Birlas at 16.45% each.

Tata's foray into the cellular market with its own subsidiary, Tata Indicom, a CDMA-based mobile provider, cropped differences between the Tatas and the Birlas. This dual holding by the Tatas also became a major reason for the delay in Idea being granted a license to operate in Mumbai. This was because as per Department of Telecom (DOT) license norms, one promoter could not have more than 10% stake in two companies operating in the same circle and Tata Indicom was already operating in Mumbai when Idea filed for its license.

The Birlas thus approached the DOT and sought its intervention, and the Tatas replied by saying that they would exit Idea but only for a good price. On April 10, 2006, the Aditya Birla Group announced its acquisition of the 48.18% stake held by the Tatas at Rs. 40.51 a share amounting to Rs. 44.06 billion. While 15% of the 48.14% stake was acquired by Aditya Birla Nuvo, a company in-charge of the Birlas' new business initiatives, the remaining stake was acquired by Birla TMT holdings Private Ltd., an
AV Birla family owned company. Currently, Birla Group holds 98.3% of the total shares of the company.

Idea has successfully launched 3 more new circles (states) in India viz. Rajasthan, Himachal Pradesh and UP (East) to make itself a pan-India player. Recently, Idea got licenses to operate in Mumbai & Bihar. They are awaiting the spectrum from DoT.

**Reliance:** The Late Dhirubhai Ambani dreamt of a digital India - an India where the common man would have access to affordable means of information and communication. Dhirubhai, who single-handedly built India’s largest private sector company virtually from scratch, had stated as early as 1999: “Make the tools of information and communication available to people at an affordable cost. They will overcome the handicaps of illiteracy and lack of mobility.”

It was with this belief in mind that Reliance Communications (formerly Reliance Infocomm) started laying 60,000 route kilometres of a pan-India fibre optic backbone. This backbone was commissioned on 28 December 2002, the auspicious occasion of Dhirubhai’s 70th birthday, though sadly after his unexpected demise on 6 July 2002. Reliance Communications has a reliable, high-capacity, integrated (both wireless and wireline) and convergent (voice, data and video) digital network. It is capable of delivering a range of services spanning the entire infocomm (information and communication) value chain, including infrastructure and services - for enterprises as well as individuals, applications, and consulting.

Today, Reliance Communications is revolutionising the way India communicates and networks, truly bringing about a new way of life.

**Tata Indicom:** Tata Teleservices Limited (TTSL) is part of the Tata Group of Companies, an Indian Conglomerate. It runs the brand name Tata Indicom in India in various telecom circles of India. The company forms part of the Tata Group's presence in the Telecommunication Industry in India, along with Tata Teleservices (Maharashtra) Limited (TTML) and VSNL.
TTSL was incorporated in 1995 and was the first company to offer CDMA Mobile services in India, specifically in the state of Andhra Pradesh. In December 2002, the company acquired the erstwhile Hughes Telecom (India) Ltd. which was renamed Tata Teleservices (Maharashtra) Limited. In September 2007, Tata Indicom launched the Talk World plan, an International Long Distance Plan.

Tata is the direct competitor with Reliance, both CDMA operators in India. The company provides unified telecommunication solutions including mobile, fixed wireless, fixed line and broadband. Other competitors are Vodafone, Airtel, Aircel, Idea, MTNL, BSNL providing GSM based mobile telephony.

The company was first in India to provide free intra network calling within city limits. They launched a unique scheme providing lifetime rental free connectivity on its mobile and fixed wireless for a one time charge.

Tata Teleservices is part of the INR Rs. 119000 Crore (US$ 29 billion) Tata Group, that has over 87 companies, over 250,000 employees and more than 2.8 million shareholders. With a committed investment of INR 36,000 Crore (US$ 7.5 billion) in Telecom (FY 2006), the Group has a formidable presence across the telecom value chain.

Tata Teleservices spearheads the Group’s presence in the telecom sector. Incorporated in 1996, Tata Teleservices was the first to launch CDMA mobile services in India with the Andhra Pradesh circle.

Starting with the major acquisition of Hughes Tele.com (India) Limited [now renamed Tata Teleservices (Maharashtra) Limited] in December 2002 the company swung into an expansion mode. With the total Investment of Rs 19,924 Crore, Tata Teleservices has created a Pan India presence spread across 20 circles that includes Andhra Pradesh, Chennai, Gujarat, Karnataka, Delhi, Maharashtra, Mumbai, Tamil Nadu, Orissa, Bihar, Rajasthan, Punjab, Haryana, Himachal Pradesh, Uttar Pradesh (E), Uttar Pradesh (W), Kerala, Kolkata, Madhya Pradesh and West Bengal. Having pioneered the CDMA
3G1x technology platform in India, Tata Teleservices has established a robust and reliable 3G ready telecom infrastructure that ensures quality in its services. It has partnered with Motorola, Ericsson, Lucent and ECI Telecom for the deployment of a reliable, technologically advanced network.

The company, which heralded convergence technologies in the Indian telecom sector, is today the market leader in the fixed wireless telephony market with a total customer base of over 3.8 million.

Tata Teleservices’ bouquet of telephony services includes Mobile services, Wireless Desktop Phones, Public Booth Telephony and Wireline services. Other services include value added services like voice portal, roaming, post-paid Internet services, 3-way conferencing, group calling, Wi-Fi Internet, USB Modem, data cards, calling card services and enterprise services.

Some of the other products launched by the company include prepaid wireless desktop phones, public phone booths, new mobile handsets and new voice & data services such as BREW games, Voice Portal, picture messaging, polyphonic ring tones, interactive applications like news, cricket, astrology, etc. Tata Indicom redefined the existing prepaid mobile market in India, by unveiling their offering – Tata Indicom ‘Non Stop Mobile’ which allows customers to receive free incoming calls. Tata Teleservices today has India’s largest branded telecom retail chain and is the first service provider in the country to offer an online channel www.ichoose.in to offer postpaid mobile connections in the country.

**BSNL-'CellOne':** Bharat Sanchar Nigam Limited (known as BSNL, India Communications Corporation Limited) is a public sector communications company in India. It is the India's largest telecommunication company with 25.14% market share as on December 31, 2007. Its headquarters are at Bharat Sanchar Bhawan, Harish Chandra Mathur Lane, Janpath, New Delhi. It has the status of Mini-ratna - a status assigned to reputed Public Sector companies in India.
BSNL is India's oldest and largest Communication Service Provider (CSP). Currently BSNL has a customer base of 68.5 million (Basic & Mobile telephony). It has footprints throughout India except for the metropolitan cities of Mumbai and New Delhi which are managed by MTNL. As on December 31, 2007 BSNL commanded a customer base of 31.7 million Wireline, 4.1 million CDMA-WLL and 32.7 million GSM Mobile subscribers. Today, BSNL is India's largest Telco and one of the largest Public Sector Undertaking with estimated market value of $ 100 Billion.

Bharat Sanchar Nigam Ltd. formed in October, 2000, is World's 7th largest Telecommunications Company providing comprehensive range of telecom services in India: Wireline, CDMA mobile, GSM Mobile, Internet, Broadband, Carrier service, MPLS-VPN, VSAT, VoIP services, IN Services etc. Within a span of five years it has become one of the largest public sector unit in India. BSNL has installed Quality Telecom Network in the country and now focusing on improving it, expanding the network, introducing new telecom services with ICT applications in villages and winning customer's confidence. Today, it has about 47.3 million line basic telephone capacity, 4 million WLL capacity, 20.1 Million GSM Capacity, more than 37382 fixed exchanges, 18000 BTS, 287 Satellite Stations, 480196 Rkm of OFC Cable, 63730 Rkm of Microwave Network connecting 602 Districts, 7330 cities/towns and 5.5 Lakhs villages. BSNL is the only service provider, making focused efforts and planned initiatives to bridge the Rural-Urban Digital Divide ICT sector. In fact there is no telecom operator in the country to beat its reach with its wide network giving services in every nook & corner of country and operates across India except Delhi & Mumbai. Whether they are in inaccessible areas of Siachen glacier and North-eastern region of the country, BSNL serves its customers with its wide bouquet of telecom services. BSNL is numero uno operator of India in all services in its license area. The company offers vide ranging & most transparent tariff schemes designed to suite every customer. BSNL cellular service, ‘CellOne’, has more than 17.8 million cellular customers, garnering 24 percent of all mobile users as its subscribers. That means that almost every fourth mobile user in the country has a BSNL connection. In basic services, BSNL is miles ahead of its rivals, with 35.1 million Basic Phone subscribers i.e. 85 per cent share of the subscriber base and 92 percent share in revenue terms. BSNL has more than 2.5 million WLL subscribers and 2.5 million Internet Customers who access Internet through various modes viz. Dial-up, Leased Line, DIAS, Account Less Internet (CLI). BSNL has been adjudged as the NUMBER ONE ISP in the country.
BSNL has set up a world class multi-gigabit, multi-protocol convergent IP infrastructure that provides convergent services like voice, data and video through the same Backbone and Broadband Access Network.

1.10.2 Cellular Phones Market Growth in India

The cellular phone industry is considered to be the fastest growing industry in India. It is believed that the high and accelerated growth of cellular market has eventually added to the worth of Indian economy.

The Indian cellular services market recorded the highest growth across Asia-Pacific and Japan region in 2004, with a compounded annual growth rate of 67 percent. Since the industry came into being in the mid 1990s, its average per annum growth rate has been a phenomenal 85 percent. By the end of 2002, the Indian cellular phone industry had over 10 million subscribers. The industry has undergone a number of changes over the years. The National Telecom Policy 1999 was an important landmark in the development of the cellular telecom industry in India; the tariff rationalization and policy regulation introduced in the Policy helped the industry grow at the pace it did.

The years 2001 and 2002 saw an increase in level of competition in the industry with more operators being given licenses, and fixed line providers also entering the mobile market. In the years ahead, there was more of competition between cellular service providers.

The key factor contributing to the increased growth is the rising standard of income. The industry is also eyeing rural areas of the country as new opportunities to prosper. Millions of subscribers are increasing every month including the rural areas. Still, more growth is expected in the future years.

Opening up of international and domestic long distance telephony services are growth drivers in the industry. Cellular operators now get substantial revenue from these services, and compensate them for reduction in tariffs on air time, which along with rental was the main source of revenue. The reduction in tariffs for airtime, national long distance, international long distance, and handset prices has driven demand.

According to the latest update of July 2009, Bharti Airtel is the leading player in the mobile telephony market with 105177635 subscribers all over India, hence covering
32% of the total market. It is followed by Vodafone Essar with 78680291 subscribers covering 24% of the market. This makes it to be the second-largest cellular company in India. Others major cellular service providers in India are BSNL with 16% market share (50700367 subscribers) and Idea Cellular with 15% market share (48516824 subscribers).

Indian service providers acquiring scale in the International Long Distance market through acquisitions. Acquisitions - FLAG by Reliance, Tyco and Teleglobe by Videsh Sanchar Nigam Limited. VSNL is now the world's fifth largest carrier of voice globally. Reliance’s FLAG network connects with 28 countries. FLAG’s FALCON cable system when completed would connect 12 countries with 25 international cable landing stations.

1.10.3 Cellular Phone Market Strategies in India

Opening up of international and domestic long distance telephony services are the major growth drivers for cellular industry. Cellular operators get substantial revenue from these services, and compensate them for reduction in tariffs on airtime, which along with rental was the main source of revenue. The reduction in tariffs for airtime, national long distance, international long distance, and handset prices has driven demand.

Prominent among these were - celebrity endorsements, loyalty rewards, discount coupons, business solutions and talk time schemes. The most important customer segments in the cellular industry were the youth segment and the business class segment. The youth segment was the largest and fastest growing segment and was therefore targeted most heavily by cellular service providers. Bharti Tele-Ventures adopted celebrity endorsement as its chief promotional strategy. By 2004 it emerged the unprecedented leader commanding the largest market share in the cellular service market. Vodafone implemented the celebrity endorsement strategy partially, relying primarily on its creative advertising for the promotion of its brand. BSNL, on the other hand, attracted the customer through its low cost schemes. Being a state owned player, BSNL could cover rural areas, and this helped it increase its subscriber base. Reliance was another player that cashed on its innovative promotional strategies which included
celebrity endorsements and attractive talk time schemes. Idea, relied heavily on its creative media advertising sans celebrities.

1.10.4 Value Added Services (VAS)

Value Added Services is that service which is not part of the basic voice offer and is availed off separately by the end user. It is provided by telecom service providers. These services are used as a tool for differentiation and allow the mobile operators to develop another stream of revenue.

Various VAS – news, finance, entertainment, travel, download, astrology, contest, MMS, email, music, cricket, GPRS, call alert, health, M-commerce, etc. As per COAI, income from VAS was 10% of total income of service providers in 06-07 SMS 57%, Caller line identification 6%, Other VAS 19%, Ring tones 7%, Content download 6%, GPRS 5%

VAS is supplied either in-house by the mobile network operator themselves or by a third party VASP, aka Content Provider (CP). VASPs typically connect to the operator using protocols like SMSC or to a messaging gateway that allows the operator to control and charge of the content better. There are many national and international investors ready to invest in this segment of telecom sector.

1.10.5 3G Spectrum

3G phones is a new concept in Indian telecom market. It is notable for its ability to support faster and larger quantities of data, which enables additional service offerings in the form of games, music and video using voice video and data (triple play) and helps to bring about broadband on mobiles.

There are more than 60 3G networks across 25 countries. 3G services are supposed to provide high-speed data rates at a minimum of 144kbps in all use scenarios going up to 2 mbps in low mobility and indoor environments. It has higher capacity and improved spectrum efficiency. The amount of bandwidth needed for 3G services could be as much as 15-20MHz.
3G helps to simultaneously transfer both voice data and non-voice data. The highlight of 3G is video telephony. 3G spectrums have been provided to GSM and CDMA players like BSNL, MTNL, Bharti, Reliance, Tata and Vodafone. GSM players operate on 900 MHz and 1800MHz while CDMA players operate on 800 MHz. 3G services enhance the internet speed, fast downloading and video calling.

1.10.6 Main 3G issues for service providers and users:
- High spectrum licensing fees for 3G services
- Huge capital required to build infrastructure for 3G services
- Health impact of electromagnetic waves
- High prices for 3G mobile services
- Difficulty in switching from 2G to 3G technology
- Takes time to catch up as the service is new 3G Allocations

1.10.7 Telecom Regulatory Authority in India
TRAI’s mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace which will enable India to play a leading role in emerging global information society.

One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilities fair competition. In pursuance of above objective TRAI has issued from time to time a large number of regulations, orders and directives to deal with issues coming before it and provided the required direction to the evolution of Indian telecom market from a Government owned monopoly to a multi-operator multi-service open competitive market. The directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

1.10.8 Cellular Operators Association of India (COAI)
The Cellular Operators Association of India (COAI) was constituted in 1995 as a registered, non-profit, non-governmental society dedicated to the advancement of communication, particularly modern communication through Cellular Mobile
Telephone Services. With a vision to establish and sustain a world-class cellular infrastructure and facilitate affordable mobile communication services in India, COAI's main objectives are to protect the common & collective interests of its members.

With a vision to establish and sustain a world-class cellular infrastructure and facilitate affordable mobile communication services in India. Keeping the mandate given to it, COAI is the official voice for the Indian Cellular industry and on its behalf it interacts with the policy maker, the licensor, the regulator, the spectrum management agency, the industry (telecom/non-telecom) associations.

1.11 Present Status of Cellular Phones in India

Telecommunications sector in India today, we can primarily identify two segments namely Fixed Service Provider (FSPs) and Cellular Services. Some of the essential and basic telecom services forming part of Indian telecom industry include telephone, radio, television and Internet. Telecom industry in the country lays a special emphasis on some of the advanced and the latest technical innovations like GSM (Global System for Mobile Communications), CDMA (Code Division Multiple Access), PMRTS (Public Mobile Radio Trunking Services), Fixed Line and WLL (Wireless Local Loop). Especially, India has a flourishing market in GSM mobile service, while the number of subscribers is on rapid and dramatic increase. The Indian telecommunications industry boasts as being one among the most rapidly growing chunks on the globe. Experts around the world estimate that India holds the promise of emerging as the second largest telecom market of the world.

Figures published by the Telecom Regulatory Authority of India (TRAI), reveal that the number of telecom connection subscribers in India reached 562.21 million in December 2009, marking a 3.5 percent increase over the number 543.20 million reported in November 2009. This figure indicates that the average teledensity (number of telephones per 100 persons) has gone up to 47.89.

Business Monitor International has stated that at present, India is adding up about 8-10 million mobile subscribers every succeeding month. Estimates have revealed that by June 2012, almost half of the Indian population will be in possession of a mobile phone. This will result in about 612 million mobile subscribers, making up a teledensity of about 51 per cent by the year 2012.
The latest reports published by Evalueserve state that the availability of the 3G spectrum has given hopes of finding about 275 million Indian subscribers using 3G-enabled services.

A Frost & Sullivan industry analyst has predicted that by the year 2012, revenues from fixed line subscriptions in India will reach up to US$ 12.2 billion, while the revenue from mobile connections will reach up to US$ 39.8 billion.

BSNL, the state-managed telecom operator has introduced 3G services in more than 318 cities benefiting 856,000 subscribers. BSNL has been venturing to cross more than 400 cities in the near future eventually rolling this service across 760 cities by September 2010. While the debate on 3G is seen continuing, TRAI has already started consulting on the next higher level of telecom services. 4G or the fourth generation enables downloads faster than all the earlier versions.

Today, India is the largest market in the world adding up a dramatic number of about 20 million mobile subscriber lines every month in an average. On the other hand, the number of landlines is found gradually decreasing. At the end of the first quarter in 2010, we find that the overall telecom subscriber penetration has gone up by more than 52 %. Though this might occur as a relatively low volume compared with a number of other nations, this comes as a quantum leap noting the figures recorded a few years back. Mumbai and Delhi (NCR) enjoy the status among a few other metro areas around the globe boasting of more than 25 m mobile subscribers in each of these regions.

It is predicted that mobile number portability (MNP) will be available throughout India by the second quarter of 2010, initially in the cities of Chennai, Delhi, Kolkata and Mumbai, the four metros of India. On 20th January 2011 Mobile number portability (MNP) has started in India. This will enable mobile phone users to retain their mobile number while changing their mobile service provider. This is a very welcome development for mobile phone subscribers in the country. This service is available for both post-paid and prepaid subscribers and on both GSM and CDMA technology platforms but only within your own telecom circle.

According to analysts MNP will increase competition among service providers as comparatively new operator companies would try to woo premium customers with the
older networks to change their network by offering freebies. It will also force telecom companies to improve the quality of services which is in favour of the customers.

Also, 3G (third generation) mobile services are found being introduced in all the major cities across the nation.

1.12 Future of Cellular Phones in the world

1.12.1 A Look into the Future

With wireless number and home to cell phone portability now live, wireless dominance is now foreseen. The wireless revolution will occur slowly. Changes and new technology will be introduced. Cutting the wire line cord is inevitable. The world is going wireless - totally.

1.12.2 Your Telephone Number - A Second Social Security Number

You may want to choose your telephone number wisely. Over the next few years, your telephone number can be just as important to you as your social security number - you may only need one. With number portability, for the time being you can only take a telephone number with you in a local calling area. This will not last. Expect in the next few years the idea of area codes, the three digit code of a number, to lose it's importance of identifying the city and state you live in. Change states, keep your number. Move 10 times, keep your number. The lines that separate area codes into states will get blurred - thanks to wireless.

1.12.3 Wireless Industry changes ahead

All the major carriers view the new rule of home number to cell phone a victory, and a chance to increase market share. In order for the wireless revolution to take effect, two industry changes will occur:

- Reception areas will increase - worldwide. The wireless revolution cannot take place until reception and coverage areas increase. The new technologies such as advanced TDMA, CDMA and GSM can handle the clearness of calls, but carriers networks need and will get expanded so calls can be made from anywhere in the world. It's easy to cut the telephone cord when your calls are crisp, and you can make them. The concept of anytime minutes will no longer exist. In order for the revolution to thrive, calls need to
be made anywhere, and anytime. No more calling restrictions based on time. With more efficient, cost saving networks, carriers will introduce unlimited calling plans with longer contracts.

### 1.12.4 Wireless Technology Improvements - Look What's Coming

A cell phone will soon be your new best friend. Several technological improvements with the phone itself will help cut the landline cord. Imagine the new features and possibilities:

- A cell phone will be more like a PDA, large address books, calendar and the like.
- Internet access ability - DSL on a phone? Broadband through a cell phone
- Cell phones interact with appliances. Forget to start the dish washer? Set it by your phone.
- Store files and documents - your cell phone is now a desktop computer.

### 1.12.5 Internet Access Is Everything and Anything

The local phone companies’ last line of defence is Internet access. Will local phone service still be required to connect to a DSL or dial-up Internet connection? Yes. In 2010, you can hook up your laptop or desktop computer through your cell phone. Look for DSL to become 'unbundled' from a landline connection. When this happens, why would you need a local phone company?

### 1.13 Future of Cellular Phones in India

A new study coming from the Centre for Telecoms Research (CTR) in London reached the conclusion that the number of mobile phone subscribers will be of 850 million by 2011

The result of the study reveals a large number of expected subscriptions, as there are currently more than 100 million such phone contracts currently closed. Still, nearly 3 million phone users add to this number every month, which explains the high expectations that are to be reached by this market in the next 5 years.

Raj Modi, Research Director at Centre for Telecoms Research said that "The phenomenal growth in the Indian mobile phone market has largely been driven by
urban consumption. We expect this to continue with urban geographies achieving saturation levels similar to current Western European markets in the next five years."

The Indian telecommunication industry is the world’s fastest growing industry with 791.38 million mobile phone subscribers as of February 2011 and with over 851.70 million mobile phone subscribers as of June 2011.\(^4\)

### 1.14 Telecom circles in India

India today is divided into 22 telecom circles. As listed below:\(^5\)

- Assam
- Andhra Pradesh
- Bihar
- Delhi & NCR
- Gujarat
- Haryana
- Himachal Pradesh
- Jammu and Kashmir
- Karnataka
- Kerala
- Kolkata
- Madhya Pradesh
- Maharashtra & Goa
- Mumbai
- North East (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, & Tripura)
- Orissa
- Punjab
- Rajasthan
- Tamil Nadu
- Uttar Pradesh (East)
- Uttar Pradesh (West)
- West Bengal
Table 2: List of states with the largest subscriber base

<table>
<thead>
<tr>
<th>State</th>
<th>Subscriber base(^5)</th>
<th>Population (01/03/2011)(^33)</th>
<th>Mobile phones per 1000 population</th>
<th>Population (01/03/2011)(^33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uttar Pradesh</td>
<td>116,889,074</td>
<td>199,581,477</td>
<td>586</td>
<td>199,581,477</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>101,065,519</td>
<td>112,372,972</td>
<td>899</td>
<td>112,372,972</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>72,763,544</td>
<td>72,138,958</td>
<td>1009</td>
<td>72,138,958</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>62,560,974</td>
<td>84,665,533</td>
<td>739</td>
<td>84,665,533</td>
</tr>
<tr>
<td>West Bengal</td>
<td>65,829,685</td>
<td>91,347,736</td>
<td>721</td>
<td>91,347,736</td>
</tr>
<tr>
<td>Bihar</td>
<td>57,336,840</td>
<td>103,804,637</td>
<td>552</td>
<td>103,804,637</td>
</tr>
<tr>
<td>Karnataka</td>
<td>51,221,157</td>
<td>61,130,704</td>
<td>838</td>
<td>61,130,704</td>
</tr>
<tr>
<td>Gujarat</td>
<td>48,818,855</td>
<td>60,383,628</td>
<td>809</td>
<td>60,383,628</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>44,473,945</td>
<td>68,621,012</td>
<td>648</td>
<td>68,621,012</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>48,134,232</td>
<td>72,597,565</td>
<td>663</td>
<td>72,597,565</td>
</tr>
<tr>
<td>Delhi</td>
<td>41,171,114</td>
<td>16,753,235</td>
<td>2,458</td>
<td>16,753,235</td>
</tr>
<tr>
<td>Kerala</td>
<td>32,757,390</td>
<td>33,387,677</td>
<td>981</td>
<td>33,387,677</td>
</tr>
<tr>
<td>Punjab</td>
<td>30,147,893</td>
<td>27,704,236</td>
<td>1,088</td>
<td>27,704,236</td>
</tr>
<tr>
<td>India</td>
<td>851,695,668</td>
<td>1,210,193,422</td>
<td>704</td>
<td>1,210,193,422</td>
</tr>
</tbody>
</table>

A list of states (including the metros Mumbai, Kolkata and Chennai in their respective states and excluding National Capital Territory Delhi) with the largest subscriber base as of 3rd March 2011 is given below.

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33. ^ www.hindustantimes.com/India...internet-user/Article1-638366.aspx
1.14.1 Landlines

Until the New Telecom Policy was announced in 1999, only the Government-owned BSNL and MTNL were allowed to provide landline phone services through copper wire in India with MTNL operating in Delhi and Mumbai and BSNL servicing all other areas of the country. Due to the rapid growth of the cellular phone industry in India, landlines are facing stiff competition from cellular operators. This has forced landline service providers to become more efficient and improve their quality of service. Landline connections are now also available on demand, even in high density urban areas. The break-up of wire line subscriber base in India as of September 2009 is given below[^34]

<table>
<thead>
<tr>
<th>Operator</th>
<th>Subscriber base</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSNL</td>
<td>25,378,036</td>
</tr>
<tr>
<td>MTNL</td>
<td>3,458,399</td>
</tr>
<tr>
<td>Bharti Airtel</td>
<td>3,280,658</td>
</tr>
<tr>
<td>Reliance Communications</td>
<td>1,232,060</td>
</tr>
<tr>
<td>Tata Teleservices</td>
<td>1,289,179</td>
</tr>
<tr>
<td>HFCL Infotel</td>
<td>188,943</td>
</tr>
<tr>
<td>Teleservices Ltd</td>
<td>38,037</td>
</tr>
<tr>
<td>All India</td>
<td>34,865,312</td>
</tr>
</tbody>
</table>

The list of eight states (including the metros Mumbai, Kolkata and Chennai in their respective states) with largest subscriber base as of June 2011 is given below[^34]

<table>
<thead>
<tr>
<th>State</th>
<th>Subscriber base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>5,845,504</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>3,481,360</td>
</tr>
<tr>
<td>Kerala</td>
<td>3,302,031</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>2,326,813</td>
</tr>
<tr>
<td>Karnataka</td>
<td>2,741,983</td>
</tr>
<tr>
<td>Delhi</td>
<td>2,829,816</td>
</tr>
<tr>
<td>West Bengal</td>
<td>2,173,485</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>2,376,882</td>
</tr>
<tr>
<td>Gujarat</td>
<td>2,286,888</td>
</tr>
</tbody>
</table>

1.14.2 Internet Communication

India has the world's third largest Internet users with over 100 million users (of whom 40 million use the Internet via mobile phones) as of December 2010.[35] Internet penetration in India is one of the lowest in the world which is 8.4% of the population, compared to other nations like United States, Japan or South Korea where Internet penetration is significantly higher than in India.[36]

1.14.3 Broadband Communication

After US, Japan, India stands as the third largest Internet user of which 40% of Internet is used via mobile phones. India ranks one of the lowest providers of broadband speed as compared countries such as Japan, India and Norway. Minimum broadband speed of 256kbit/s but speed above 2Mbits is still in a nascent stage.

Year 2007 had been declared as “Year of Broadband” in India. Telco’s based on ADSL/VDSL in India generally have speeds up to 24Mbit max while those based on newer Optical Fiber technology offer up to 100Mbits in some plans Fiber-optic communication (FTTx). Broadband growth has been plagued by many problems.

35. ^ Press Release No. no. 35/2006 issued on 10 April 2006 by TRAI
Complicated tariff structure, metered billing, High charges for right of way, Lack of domestic content, non implementation of Local-loop unbundling have all resulted in hindrance to the growth of broadband. Many experts think future of broadband is on the hands of wireless factor. BWA auction winners are expected to roll out LTE and WiMAX in India in 2012.

The growth in number of broadband connections in India has accelerated since 2006. As of June 2011, total broadband Internet connections in India had reached 12.32 million constituting 0.9% of the population.[34][5] India has one of the lowest penetrations of broadband connectivity in the world.[9][37]

A number of private Internet Service Providers (ISPs) offer services in India, many with their own local loop and gateway infrastructures. BSNL and MTNL have continued to dominate the ISP market because of their existing massive copper infrastructure in the last-mile across the nation.

The current definition of Broadband in India is speeds of 256 kbit/s. TRAI on Dec 2010 has recommended raising this limit to 512 kbit/s.[38] The bulk of Broadband customers in India fall in this category.

1.14.4 Next Generation Network (NGN)

In the Next Generation Networks, multiple access networks can connect customers to a core network based on IP technology. These access networks include fibre optics or coaxial cable networks connected to fixed locations or customers connected through wi-fi as well as to 3G networks connected to mobile users. As a result, in the future, it would be impossible to identify whether the next generation network is a fixed or mobile network and the wireless access broadband would be used both for fixed and mobile services. It would then be futile to differentiate between fixed and mobile networks - both fixed and mobile users will access services through a single core network.

35. "Indian telecommunications industry is one of the fastest growing in the world" (doc). IBEF. Retrieved February 2010.
Indian telecom networks are not so intensive as developed country’s telecom networks and India's teledensity is low only in rural areas. 670,000 route kilometres (419,000 miles) of optical fibres has been laid in India by the major operators, even in remote areas and the process continues. BSNL alone, has laid optical fibre to 30,000 Telephone Exchanges out of their 36 Exchanges. Keeping in mind the viability of providing services in rural areas, an attractive solution appears to be one which offers multiple service facility at low costs. A rural network based on the extensive optical fibre network, using Internet Protocol and offering a variety of services and the availability of open platforms for service development, viz. the Next Generation Network, appears to be an attractive proposition. Fibre network can be easily converted to Next Generation network and then used for delivering multiple services at cheap cost.

1.14.4 Mobile Number Portability (MNP)

TRAI announced the rules and regulations to be followed for the Mobile Number Portability in their draft release on 23 September 2009. Mobile Number Portability (MNP) allows users to retain their numbers, while shifting to a different service provider provided they follow the guidelines set by TRAI. Once a customer changes his/her service provider & retaining the same mobile number they are expected to hold the mobile number with a given provider for at least 90 days, before they decide to move to another service provider. This restriction is set in place to keep a check on exploitation of MNP services provided by the service providers.[39]

As per news reports, Government of India decided to implement MNP from December 31, 2009 in Metros & category ‘A’ service areas and by March 20, 2010 in rest of the country.

It has been postponed to March 31, 2010 in Metros & category 'A' service areas. However, time and time again, lobbying by the state-run firms, BSNL and MTNL has resulted in innumerable delays in the implementation of Mobile Number portability. The latest reports suggest BSNL and MTNL are finally ready to implement the Mobile Number Portability by October 31, 2010.[40]

A press release by the Department of Telecommunications on 30 June 2010 said "Keeping the complexity and enormity of the testing involved before MNP is implemented and keeping in view the present status of implementation by various operators, it has now been decided to extend the time line for implementation of MNP to 31st October 2010."[41]

A news report on 25 November 2010 said Mobile Number Portability (MNP) was finally launched in Haryana. The MNP service inaugurate by the Union Minister of Communications & IT Mr. Kapil Sibal by making the inaugural call to Shri Bhupinder Singh Hooda, the Chief Minister of Haryana from a ported mobile number in function held at Rohtak city.[42]

Another news report said it will be implemented across India on January 20, 2011. Even as DoT has recommended a porting fee of Rs. 19, some operators such as Idea Cellular may consider waiving off the porting charges.[43]

**Finally Mobile Number Portability**

On 20th January 2011 Mobile number portability (MNP) has started in India.[50] It enables mobile phone users to retain their mobile number while changing their mobile service provider. This is a very welcome development for mobile phone subscribers in the country. The service is available for both post-paid and prepaid subscribers and on both GSM and CDMA technology platforms but only within your own telecom circle. According to analysts MNP will increase competition among service providers as comparatively new operator companies would try to woo premium customers with the older networks to change their network by offering freebies. It will also force telecom companies to improve the quality of services which is in favour of the customers.

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1.15 Effect of Cell Phones on Landline Telephones in India

In India the sharp decline in tariffs is evident from the exercise carried out by the Telecom Regulatory Authority of India (TRAI) recently, which proves that the spread of the cellular services across the country has shaken up the landline market.

The overall cellular mobile tariff (effective amount per minute including all fixed and variable costs paid by the subscriber) for 100 minutes/month of usage has declined from a level of Rs 6.32/month for the quarter ended December 2000 to Rs 1.77/month for the quarter ended September 2003, showing thereby a decline of about 72 per cent. Likewise in the case of tariff offered by WLL operators, it has declined from a level of Rs 4.27/minute in the quarter ended March 2001 to Rs 2.08/minute for the quarter ended September 2003 (51 per cent decline). Reason enough for a landline subscriber to shift to the more convenient wireless service.

Is the landline market dead because of wireless cell phones? The answer would be ‘Yes almost’. The advent of cell phones and wireless are so aggressive that the traditional phones have now become almost useless.

You can just access the web via high speed DSL which uses a landline telephone company or a landline cable company to access the Internet. But even that has become out of date in some places.

1.15.1 Loss of landlines
Previously the call rate of landlines was Rs. 2 per call- landline to landline and Rs.3 per call- for landline to mobile phones (in India). Today it is decreased to one rupee for all calls- both landlines and cell phones. Most of the BSNL and MTNL subscribers have given up landlines and switched on to cell phones because of its mobility and affordability.

1.15.2 Cell and broadband internet card
The only reason why people till now bore landlines was for the accessibility of internet through DSL modem. But today even broadband internet card is available which lets
you access World Wide Web by just plugging in the USB device with the broadband internet card inserted.

1.15.3 **Online VoIP applications**

Along with Incumbent Local Exchange Carriers (ILECs) losing long distance minutes to cheaper, wholesale providers, the overall landline subscriber base in most parts of the U.S. and Canada is declining at an alarming rate. Even in India the Bharat Sanchar Nigam Ltd (BSNL) and Mahanagar Telephone Nigam Ltd (MTNL), have witnessed the surrender of landline connections, with close to two million subscribers in the first seven months of the current fiscal. The latest estimates report the figures to 17.9 lakh BSNL subscribers across the country.

Cell phones are largely responsible for this, as the cost of wireless voice minutes sinks to more reasonable levels.

1.15.4 **Strong competition from the cable sector**

This is another major factor, as incumbent cable giants equip their networks to handle IP-based digital telephone calls. These companies are having a much more profound effect on the telephone market than standalone VoIP providers like Vonage, since most cable providers have the built-in advantage of an existing subscriber base.

Hence it is evident that the landline market is almost dead because of wireless cell phones.

1.16 Internet Communication on Mobile Phones

1.16.1 The Journey of “G” from 1st to 5th Generation

Until the controversial spectrum scams were brought up in the limelight, many were ignorant of what 1G, 2G or 3G stood for, and all of a sudden a hike was found out amongst laymen so as to be knowledgeable about it. Still, a number of people are unaware of 1G or 2G when the world has moved on to 4G.

The telecommunication service in the World had a great leap in the last few years. 6 billion people own mobile phones. It may be interesting to analyze the various generations of cellular systems as studied in the evolution of mobile communications from 1st generation to 5th generation. Now almost all the service providers as well as the customers seek for availing these 3G and 4G services.

We can analyse that this could be due to increase in the telecoms customers day by day. In the present time, there are four generations in the mobile industry. These are respectively 1G the first generation, 2G the second generation, 3G the third generation, and then the 4G the fourth generation. Ericsson, a Swedish company, is launching this high tech featured mobile into the market. It is being first introduced in the Swedish capital city, Stockholm.

1.16.2 Understanding the 2G services

Second Generation (2G) wireless cellular mobile services was a step ahead of First Generation (1G) services by providing the facility of short message service (SMS) unlike 1G that had its prime focus on verbal communication. A typical 2G G.S.M network service ranges from 800/900MHz or 1800/1900 spectrum. The bandwidth of 2G is 30-200 KHz.

1.16.3 Analysis of 1G and 2G services

In 1G, Narrow band analogue wireless network is used, with this we can have the voice calls and can send text messages. These services are provided with circuit switching. Today’s the usual call starts from the beginning pulse to rate to the final rate. Then in case of 2G Narrow Band Wireless Digital Network is used. It brings more clarity to the conversation and both these circuit-switching model.
Both the 1G and 2G deals with voice calls and has to utilize the maximum bandwidth as well as a limited till sending messages i.e. SMS. The latest technologies such as GPRS, is not available in these generations. But the greatest disadvantage as concerned to 1G is that with this we could contact with in the premises of that particular nation, where as in case of 2G the roaming facility a semi-global facility is available.

1.16.4 The transient 2.5 Generation
In between 2G and 3G there is another generation called 2.5G. Firstly, this mid generation was introduced mainly for involving latest bandwidth technology with addition to the existing 2G generation. To be frank but this had not brought out any new evolution and so had not clicked to as much to that extend.

1.16.5 Understanding the 3G Generation
But to overcome the limitations of 2G and 2.5G the 3G had been introduced. In this 3G Wide Brand Wireless Network is used with which the clarity increases and gives the perfection as like that of a real conversation. The data are sent through the technology called Packet Switching. Voice calls are interpreted through Circuit Switching. It is a highly sophisticated form of communication that has come up in the last decade.

In addition to verbal communication it includes data services, access to television/video, categorizing it into triple play service. 3G operates at a range of 2100MHz and has a bandwidth of 15-20MHz. High speed internet service, video chatting are the assets of 3G.

1.16.6 An insight into the basic differences of 2G from 3G
- In comparison to 2G customers will have to pay a relatively high license fee for 3G.
- The network construction and maintenance for 3G is much expensive than 2G.
- From the point of view of customers, expenditure will be excessively high if they make access to various facets of 3G.

1.16.7 Understanding Packet Switching
This is actually done by supplying various addressed packets, which will be interconnected to have the conversation. It is not necessary to create a new dedicated
path for sending the data. It had been modified in such a way that the data can be send through any path; hence, this data will be received at a less time as compared to that of voice calls.

1.16.8 Packet Switching in Computer networks

The data packs are also used in computer that is when we connected with internet this data pack helps to download the web pages that is being displayed in the monitor. For a Data Pack it does not need any separate path for downloading or displaying any objects in the computer or any other equipment. This is due to the reason that by networking, separate paths are being created and after analyzing each, the data are being transferred to the correct access point.

1.16.9 Main 3G Services

With the help of 3G, we can access many new services too. One such service is the GLOBAL ROAMING. Another thing to be noted in case of 3G is that Wide Band Voice Channel that is by this the world has been contracted to a little village because a person can contact with other person located in any part of the world and can even send messages too. Then the point to be noted is that 3G gives clarity of voice as well can talk with out any disturbance. Not only these but also have entertainments such as Fast Communication, Internet, Mobile T.V, Video Conferencing, Video Calls, Multi Media Messaging Service (MMS), 3D gaming, Multi-Gaming etc are also available with 3G phones.

1.16.10 Main 4G Features

While it is still too early to estimate as to how many number of people have moved on from 2G to 3G, technology has come up with the latest of its type namely 4G. A successor of 2G and 3G, 4G promises a downloading speed of 100 Mbps and is yet to shower its many wonders on them. The Fourth Generation that is 4G in addition to that of the services of 3G, promises some additional features such as Multi-Media Newspapers, also to watch T.V programs with the clarity as to that of an ordinary T.V. In addition, we can send Data much faster than that of the previous generations.
1.17 Need for this Study

In today’s competitive world, every Cellular Service Provider has to provide excellent services to attain a major market share and keep their Customers satisfied in all aspects.

The aim of the study was to objectively understand the behaviour of Cellular Phone users in Pune and further capture their satisfaction levels that are influenced by various technical and non-technical factors.

This research study may be useful for Cellular Service providers in Pune to understand the expectations and requirements of Customers and can serve them in a better way.

The Telecom Regulatory Authority of India publishes a quarterly report on ‘The Indian Telecom Services Performance Indicators’. The information contained in the report is collected from various telecom operators and service providers.

The Telecom Regulatory Authority of India (TRAI) under the TRAI Act, 1997, the Authority has been conducting periodical survey of the quality of basic and cellular telephone services provided by different telecommunication service providers all over the country.

The survey covers an assessment of the level of satisfaction with the services received by subscribers of these telephone service providers. Despite the surveys conducted by TRAI, the present study was deemed necessary because of the following reasons: Performance indicators captured by TRAI, particularly the surveys conducted to assess the customer satisfaction misses out on the multifaceted nature of customer satisfaction and thus do not capture the status of customer satisfaction holistically.

This study may give a comprehensive assessment of the satisfaction of customers encompassing quality of technical service. This study may also provide input to insights on the customer behaviour in the mobile phone industry especially in Pune.

1.18 Conclusion: Further to this, the researcher has attempted to write a Chapter on detailed Literature Survey conducted, regarding Concepts of Customer Satisfaction, various Satisfaction Models and work done by other leading researchers.