

Economic Development and Growth under Telecommunication Sector in India – An Empirical Case Study

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Section – I

Abstract

Developing countries like India have realized the importance of communication in the later part of 20th century. Indian Telecommunication sector has emerged as one of the critical components of economic growth required for overall socio-economic development of the country as there is a positive correlation between the penetration of mobile services and internet on the growth of gross domestic product (GDP) of a country. Telecommunication sector is one of the prime support services needed to promote growth and modernization of various sectors of an economy. Globalization, privatization and liberalization accelerated all round reforms in many sectors, especially in developing economies, in the world. Today, India's Telecom sector stands second in the world in terms of market share. Based on the data available from Groupe Speciale Mobile Association (GSMA), this sector will create close to 4 million additional jobs by 2020. The government has ensured fair competition among service providers and a fair and proactive regulatory framework that has resulted in telecom services being available to consumer at affordable prices. Further, it has made concerted efforts at encouraging telecom equipment manufacture. The deregulation of foreign direct investment (FDI) norms has led to an increase in FDI in the sector.

Through this paper the researcher an attempt has been made to analyze the trends in the growth and development of Telecommunication sector in India. Not only that, researcher also shows that the socio-economic impact of Telecommunication sector in India or Indian. Researcher also considers the last 10 FY's secondary data in this empirical study.

Keywords

Telecommunication sector, economic growth under telecommunication sector, economic development under telecommunication sector, GDP, SWOT analysis, causality analysis, tele-density

Preamble

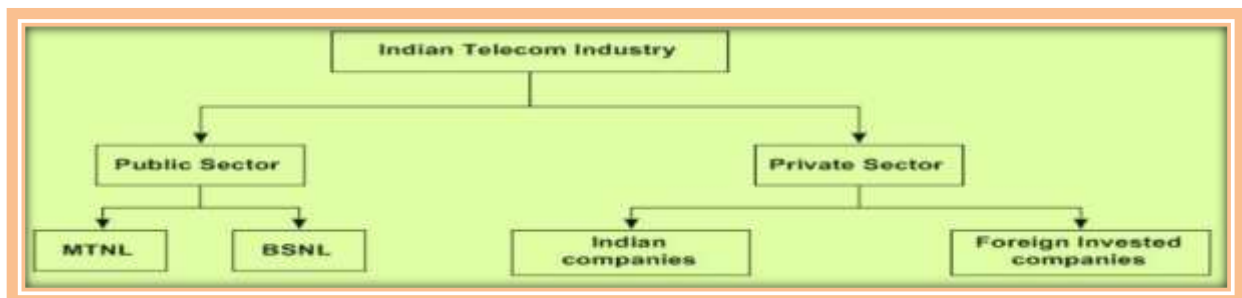
Telecom is an essential infrastructure for economic development and hence for the improvement of the quality of human life. In the 21st century, telecommunication sector has become pivotal to a country's socio-economic development. Telecom sector in India is over 166 years old. Introduction of Telecommunications in India dates back to 1851 when the first landlines were made operational by the government at a place near Kolkata. Telephone services were formally introduced in India in 1881 and were subsequently merged with the postal system in 1883. Post-independence, Posts, Telephone and Telegraph (PTT) body was formed by nationalization of all telecommunication

companies and its governance was under the Ministry of Communication.

Tele-density of Indian telecom industry (wireless plus wire line) has grown from a low of 3.60 percent in March 2001 to 84 percent in March 2016. The mobile subscriber base (GSM and CDMA combined) has grown from under 2 mn at

the end of FY 1999–2000 to 1033.63 mn at the end of March 2016. This substantial leap, both in terms of number of consumers as well as revenues from telecom services has contributed significantly to the growth of Indian GDP and also provided much needed employment.

Figure 1: Indian Telecommunication Industry



Source: www.google.com

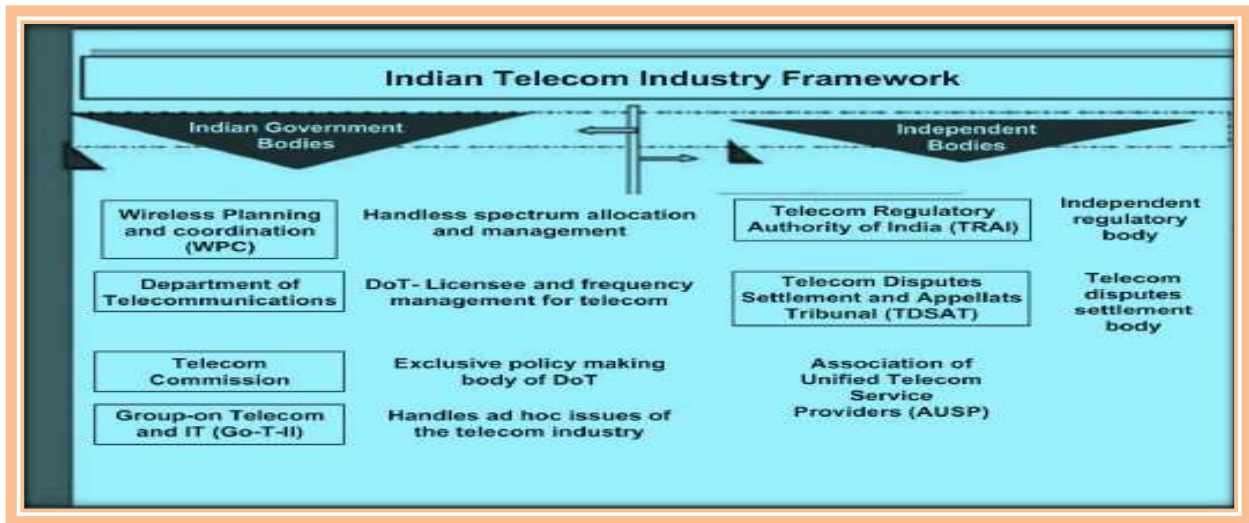
India's telecommunication network is the second largest in the world by number of telephone users (both fixed and mobile phone) with 1.206 billion subscribers as on 31st March, 2018. It has one of the lowest call tariffs in the world enabled by mega telecom operators and hyper-competition among them. As on 30th March 2018, India has the world's second-largest Internet user-base with 412.60 million internet subscribers in the country. Major sectors of the Indian telecommunication sector are telephone, internet and television broadcast industry in the country which is in an ongoing process of transforming into next generation network, employs an extensive system of modern network elements such as digital telephone exchanges, mobile switching centres, media gateways and signaling gateways at the core, interconnected by a wide variety of transmission systems using fibre-optics or microwave radio relay networks. The access network, which connects the subscriber to the core, is highly diversified with different copper-pair, optic-fibre

and wireless technologies. DTH, a relatively new broadcasting technology has attained significant popularity in the Television segment. The introduction of private FM has given a fillip to the radio broadcasting in India. Telecommunication in India has greatly been supported by the INSAT system of the country, one of the largest domestic satellite systems in the world. India possesses a diversified communications system, which links all parts of the country by telephone, internet, radio, television and satellite. Indian telecom sector underwent a high pace of market liberalization and growth since the 1990s and now has become the world's most competitive and one of the fastest growing telecom markets. The Industry has grown over twenty times in just ten years, from under 37 million subscribers in the year 2001 to over 846 million subscribers in the year 2011. India has the world's second-largest mobile phone user base with over 1183.41 million users as of March 2018. Telecommunication has supported the socio-economic development of India and has

played a significant role to narrow down the rural-urban digital divide to some extent. It also has helped to increase the transparency of governance with the introduction of e-governance in India. The government has pragmatically used modern telecommunication facilities to deliver mass education programmes for the rural folk of India. According to London-based telecom trade

body GSMA, the telecom sector accounted for 6.5 percent of India's GDP in 2015, or about ` 9 lakh crore, and supported direct employment for 2.2 million people in the country. GSMA estimates that the Indian telecom sector will contribute ` 14.5 lakh crore to the economy and support 3 million direct jobs and 2 million indirect jobs by 2020.

Figure 2: Indian Telecommunication Sector – Framework



Source: www.google.com

Tele-density

Tele-density indicates the number of telephone connections per hundred people. It is a significant indicator of telecom penetration in the country. There is an exponential growth of tele-density in India due to the evolution of hi-tech wireless technologies. Tele-density in India was 91.64 percent at the end of November, 2017. The rural tele-density is now 56.58 percent while that in urban areas it is 167.50 percent. Amongst the service areas, himachal Pradesh (153.96 percent)

had the highest tele-density followed by Tamil Nadu (124.38 percent), Punjab (123.62 percent), Kerala (118.58 percent) and Gujrat (110 percent). On the other hand, tele-density is comparatively low in service areas such as Bihar (72.90 percent), Assam (68.41 percent), Madhya Pradesh (69.47 percent), Uttar Pradesh (69.66 percent), West Bengal (72.90 percent) and Odisha (79.58 percent). Amongst the metros, Delhi tops in tele-density with 259.14 percent followed by Kolkata (184.56 percent) and Mumbai (169.97 percent).

Figure 3: A Snapshot of Indian Telecommunication Sectors' Present Status

Snapshot of present status As on Nov. 30, 2017
• Indian telecom network is 2nd largest in the world in terms of telephone connections
• Country has 1186.22 million telephone connections
• There are 1162.81 million wireless telephone connections
• Overall tele-density in the country is 91.64%
• Urban tele-density is 167.5%
• Rural tele-density is 56.58%.
• Share of wireless telephones in total telephones is 98.03%.
• The share of private sector in total telephones is 89.26%.
• Number of Broadband connections is 340.16 million at the end of Oct, 2017

Source: www.google.com

Objectives

The central objective of my empirical research study is to find out the trends in the coverage of Indian telecommunication sector in the main-stream growth and development of Telecommunication sector and its socio-economic impact on our daily life. The objectives are –

- ✓ To study the history and evolution of the telecommunication sector in India.
- ✓ To study the growth-development of Indian telecommunication sector.
- ✓ To identify the present trends in the Indian Telecom Industry and its growth.
- ✓ To evaluate and understand current set of challenges faced by Telecom industry in India.
- ✓ To study the strength, weakness, opportunities and threats of Indian telecommunication sector.
- ✓ To submit the findings as an outcome of this empirical research.

Survey of Related Literature

Relationship between telecommunication development and economic growth has attracted the attention of researchers especially since 1980s.

This section reviews the empirical studies on the relation between recession and economic activities in India. One school of thought contended that, FDI has a negative effect on the development of India in light of the fact that FDI streams principally towards the essential area which essentially pushed the less market esteem. However, an alternate school of thought contended that, FDI inflow into the center segments is expected to assume an imperative part as a wellspring of capital, administration and innovation in countries transaction economies. Many studies confirmed a clear and positive correlation between telecommunications and economic growth [for examples - Hardy (1980), Saundres.ed.al (1994), Lichtenberg (1995), Greenstein and Spillar (1996) and Norton (1992)]. Roller and Waverman (1996) investigated the impact of telecommunication infrastructure for 21 OECD countries over a period of 20 years and found a significant positive link between the two. Dutta (2001) applied Granger causality tests for a cross section of 30 developing and industrialized countries in three different years, and found a bi-directional causality for both developing and industrialized countries. The efforts

of previous other researchers have been briefed out below;

According to Joshi (2014), World Bank believes that an increase in mobile and broadband penetration increases the per capita GDP by 0.81 percent and 1.38 percent respectively in the developing countries. After post-liberalization, exponential growth on Telecom Sector in India can be seen, which actually helped the country for its economical development, (Nasit, 2011).

According to, Sadr.ed.al (2012) examined the causal relationship between information and communications technology (ICT) development and economic growth in the Iran over a period of 1980-2010.

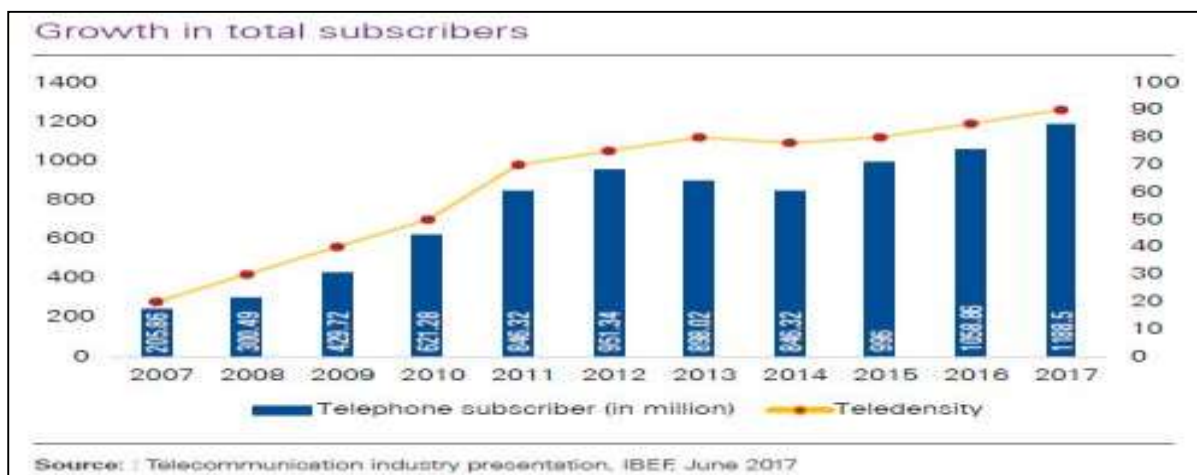
According to, Tarab (2012), the joint effort of Government and private players of this sector has improved a lot and on its way of growth and development. Active participation of the private companies, foreign direct investment, and sequence of reform measures initiated by the Government and wireless technology-played an important role in phenomenal growth of the sector in the country. It has become a very essential service, needed for rapid growth and modernization of various sector of the country's economy.

According to, Azim and Mahmood (2009) examined the casual relationship between telecommunication infrastructure and economic growth over a period of 8 years representing 24 countries and found unidirectional causality between the two from telecommunication to GDP per capita growth.

According to, Kateja and Jha (2008) investigated causal relationship between rapidly developing telecommunication industry and economic growth in India, it was found that in short run growth of telecommunication is influenced by growth in GDP, while reverse is not true.

By considering all the existing arguments, discussions, results based on the telecommunication influences over the economic growth and development, it is imperative to explore the influence of telecommunication over the economy of the India. As a result this research considered the telecommunication sector to determine the relationship between telecommunication and economic growth-development & socio-economic impact and demonstrate the derived results in the light of existing other research paper results, discussion and arguments.

Figure 4: Indian Telecommunication Sectors Growth in total Subscribers



Source: www.google.com

Telecommunication Sector

In present era, Telecommunications has evolved as a basic infrastructure like electricity, roads, water etc... and has also contributed as an important and indispensable component of economic growth. The Indian telecom sector has registered a phenomenal growth during the past few years and has become second largest telephone network in the world, only after China. A series of wireless reform and other facilities from Government of India has achieved exponential growth in past few years. National Telecom Policy-2012 (NTP-2012) has been announced during the current year with the primary objective of maximizing public good by making available affordable, reliable and secure telecommunication and broadband services across the entire country.

➤ **Telecommunication in Banking and Financial Sectors**

The challenges of time and distance have been solved with the help of digital communication in the banking system. This has not only saved time but also money by reducing transaction costs. The banking system changed with the emergence of ATM machine. These machines helped customers to do transactions outside bank premises and at convenient locations. Next the facility of phone banking with which transaction could be done through ordinary phones (Komal, 2012). These developments helped the banks to serve their customers effectively and efficiently. The usage of debit cards and credit cards has also increased for the developed telecommunication. The growth of telecom services in India has brought a huge wave of change among the Indian consumers' process of banking. There have been changes

in the basic payments and financial services. With the development of the mobile technology and increase in internet penetration consumers are increasingly using the digital platform for basic funds transfer, bill payment and balance check transactions (PWC, 2015). This had given easy accessibility to the customers to the banking and other financial services. The recent trend in banking is mobile banking. The use of this digital channel is serving as a catalyst to financial inclusion (PWC, 2010). Very soon the telecom service providers would be providing the basic banking services to its consumers. With this consumers with ordinary handset without internet connection would be able to do fund transfer, balance inquiry in savings account, change of PIN, mini statement, cheque book request, etc, with simple text messages (Ghosh & Guha, 2014).

➤ **Telecommunication in Agriculture Sector**

E-Choupal is the first of its kind initiative of internet based intervention in agricultural sector to the rural farmers of India. It was launched by ITC's Agri Business Division in 2000. This initiative helped the farmers to learn new agricultural tactics, make informed decision, understand market demand and directly deal with the company without middleman to earn more revenue. Another initiative called Nokia Life provides localized information including weather conditions, advice about crop cycles, general tips and techniques, as well as market prices for crops to the farmers through SMS (Sivakumar, 2013). Another pioneering initiative is Reuters

Market Light which provides customized information in local language through SMS on mobile phone about different aspects of agriculture (Sivakumar, 2013). Also there are farmers who are making their own portals and selling their products successfully (Mukhtar, 2015). The government has targeted to connect 10 million farmers through their mobile phones for whether and crop forecasting information to be provided by the Agromet Advisory Service (CGIAR & CCAFS, 2012).

➤ **Telecommunication in Transportation Sector**

The major mode of transportation of India is the railways. Online ticketing service IRCTC (Indian Railway Catering and Tourism Corporation) has helped reduction of 96% of the passenger reservation workload. National train Enquiry System helps passengers to get updated train running information. Freight Operations Information System (FOIS) is also facilitating the travelers (Ministry of Railways, 2014). Online travel portals have made air ticketing easier than before due to which the online travel segment forms 70% of the ecommerce business (IMRBI & IMAI, 2013). E-ticketing for bus services is also coming up big way. There are many online travel companies which provide bus tickets through their portals. Most modern feature of online bus ticketing is the m-Ticketing where consumers can purchase the bus tickets on their mobile phones (Thomas, Pathak, & Vyas, 2014). In most cities of India Radio Taxi services are becoming indispensable mode of commute. The service use GPS to locate the customer and the available cabs so that they can serve the customer in the shortest time.

Many IT firms are proving the solution to the radio taxi firms (Singh, 2007). The consumers can now use mobile application (App) to book their taxis and also make payments online (Julka & Chanchan, 2014).

➤ **Telecommunication in E-commerce & M-commerce Sector**

E-commerce and M-commerce refers to electronic commerce and mobile commerce respectively. Any economic activity that occurs online is electronic commerce. Indian ecommerce market is soon expected to be the largest among Asia Pacific countries (Agarwal, 2014). It is said that e-commerce would be soon taken over by m-commerce (PTI, 2015). Mobile commerce is the transactions done through the mobile phone applications with the help of internet. The industry of digital commerce is experiencing exponential growth in India for rising smart phone sale and affordable data plans. The private internet service providers like Bharti Airtel Ltd, Idea Cellular Ltd and Vodafone Group Plc have been slashing the mobile internet charges for increasing revenues from data services. Indian consumers are transacting online for travel, e-tail, banking, etc.

Research Methodology

The present study is secondary in nature. I do not attempt has been made to include any statistical data in this investigation. The data used for the study has been collected from Books, Magazines, Newspapers, Research Articles or Papers, Journals, E-Journals Reports, Books, and on-line data bases. For that, I have used different government websites. On the basis of previous very few research documents on this kind of particular topic,

the researcher makes here two types of analysis respectively SWOT analysis and Causality analysis.

Data Collection

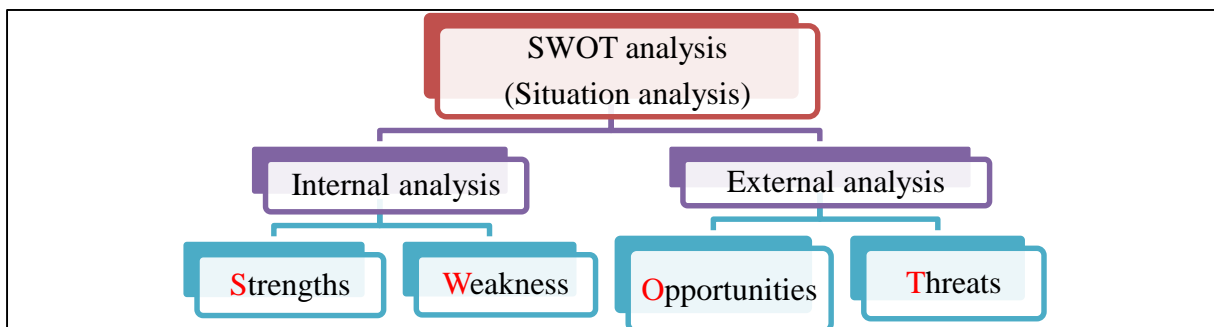
For the empirical study only secondary data has been used. The trends of the FDI's in telecomm sector are compared with the other sector in India. The data has been considered from the FY 2008 to 2018.

SWOT Analysis

India continues to be one of the fastest growing telecom markets in the world. Reforms introduced

by successive Indian governments over the last decade have dramatically changed the nature of telecommunications in the country. Telecommunications are ways to spread messages over long distances. While at one point in history fire signals might have been used to spread this information, today telephones, television, and computers are used. A SWOT analysis of the telecom industry will focus on the strengths, weaknesses, opportunities, and strengths of the organization. The industry would conduct a SWOT analysis to understand what its problems are so they can be fixed and the business can be improved.

Chart1: SWOT Analysis



Source: Author

Strengths

Cutting-edge fiber-optics technology, high-performing cable equipment, a respected brand name, excellent customer service and a strong sales team are just a few strengths that boost the resource capabilities of a telecommunication company. These strengths are attributes that enhance the company's competitive advantage.

Weaknesses

Corroded cable lines, slow service and lackluster sales are three weaknesses that can hurt a telecommunications company. Company weaknesses are competitive deficiencies that place the company at a disadvantage in the marketplace.

If corroded cable lines aren't replaced and slow service continues, for example, angry customers will switch to a rival telecommunications company that offers better services.

Opportunities

Companies should explore the potential business opportunities in the sector as mentioned below:

- **Boost to Telecom Manufacturing Companies:** In line with the 'Make in India' theme, exemption from basic customs duty, countervailing duty and special additional duty has been withdrawn on chargers, adapters, battery, wired headsets and speakers for mobile phones. This will help the local

manufacturers by making imports costlier. Correspondingly, to encourage local manufacturing, import duties on inputs that contribute into making of such parts and components have been removed.

- **Continuous Enhancements to the Mobile Value Added Services (MVAS):** To begin with VAS should cover utility services and opportunities are available in this area, specifically encompassing m-commerce, m-health, m-education, m-governance etc. Government has initiated the National e-Governance Plan, wherein many of the government services will be available to citizens online.
- **Expedient Roll-out of 4G Services:** While Airtel had already completed roll-out of 4G services across 296 towns, Vodafone having completed roll out of its 4G services on a pan-India basis and Reliance Jio also entering the fray, has boosted the customer utilization of high-end data products.
- **Infrastructure Sharing:** Since telecom business is heavy on capex and as much as 40–60 percent of the Capex is utilized for setting up and managing the Telecom infrastructure. With ARPU and revenue per tower declining over time, sharing of tower and other infrastructure is imminent. By sharing infrastructure, operators can optimize their capex, and focus on providing new and innovative services to their subscribers. In the long run, this is what will differentiate them from the competition.
- **Availability of Affordable Smart Phones and Lower Tariff Rates:** With new players both domestic and international entering the Indian handset manufacturing market, cost of

smart phones is dropping gradually. To add to this Reliance Jio has dramatically reduced the voice and data tariff rates as a result of which other players too are lowering tariff rates. Marked increase in Telecom subscriber base (expected to touch 5bn by 2020)

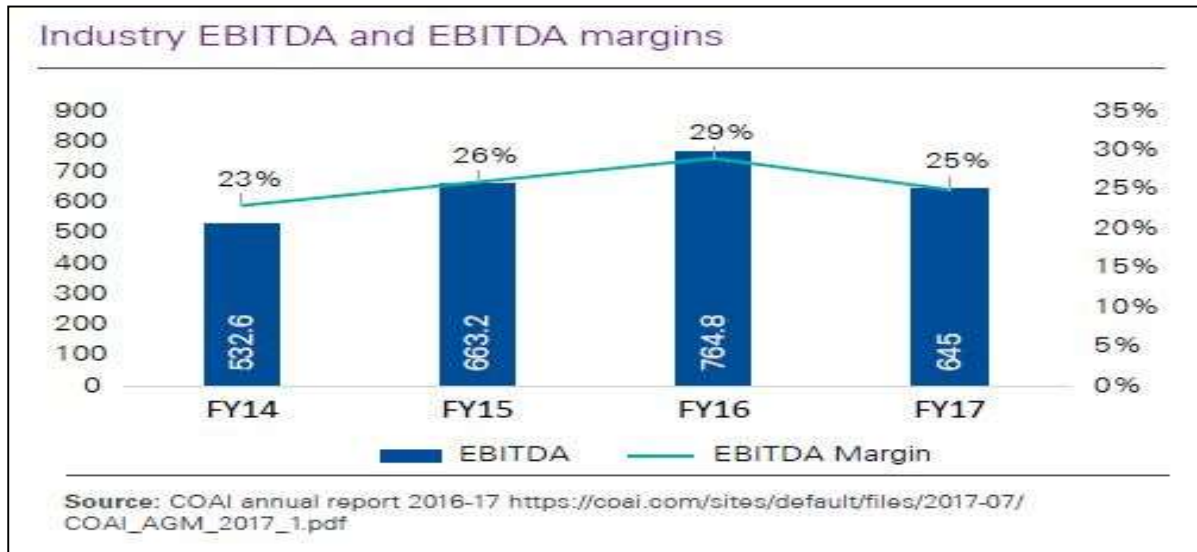
As per figures published by TRAI, India's telecom subscriber base, mobile and landline combined, touched the 1.18 billion mark at the end of February 2017. The market growth was propelled by the addition of 13.75 million mobile users during the month. The demand for once popular landline phone has been dwindling as the cheap mobile handsets, coupled with falling tariffs and freebies, have led to an explosion in cell-phone connectivity.

- **Rural Telephony–Connecting the Real India:** As per the data shared by the Telecom Minister Ravi Shankar Prasad, close to 55,669 villages in India are devoid of telephony services. The objective, under the National Telecom Policy, includes improving the rural tele-density to 70 percent by 2017 (stood at 42.4 percent in 2016), while 100 percent penetration is aimed for 2020.

Threats

A sluggish economy, increasing competition and increased government regulations against the telecommunications industry are just a few external threats that can limit a telecommunications company's future success. Threats are outside events or influences that create future hurdles for a company. New rivals that offer customers fast service and cutting-edge technology, for example, may lure an older telecommunications company's existing customers away, especially if the older company can't offer the same new features.

Figure 5: Indian Telecommunication Sector EBITDA & EBITDA Margins



Source: www.google.com

Causality Analysis

One way of looking at relationship between tele-density on the one hand and various economic variables pair-wise on the other hand is to investigate causal relationship between the two. The causal behavior of the variables can be put into four different categories:

- **Unidirectional Causality:** When ‘x’ causes ‘y’ (‘x’ to ‘y’) or when ‘x’ is caused by ‘y’ (‘x’ to ‘y’) after some lag. In other words it indicates if the estimated coefficients on lagged ‘x’ are statistically different from zero as a group and set of estimated coefficients on lagged ‘y’ is not statistically different from zero and vice versa.
- **Bilateral Causality:** When both variables ‘x’ and ‘y’ are cause of one another with some lag (‘x’ to ‘y’) or when sets of ‘x’ and ‘y’ coefficients are statistically different from zero in both the regressions.
- **Instantaneous Causality:** When both the variables ‘x’ and ‘y’ are simultaneously the cause of one another without any lag.

- **No Causality:** When one of the variables, say ‘x’ do not or is affected by the other, say ‘y’, (with or without any lag), i.e., there is no indication of causality.

Causality or Causation indicates the direction of relationship between two or more variables. Mere presence of strong correlation between two variables is not sufficient to predict the direction of causality. Causal tests help in deciding the direction of relationship between two or more variables i.e., which variable is the cause and which is effect. Granger causality (1969) methodology has been used in this study. The relationship between growth of telecommunication sector and economic growth is examined using various variables including GDP component - Financial Sector, Insurance, Real Estate, Business Services, GDP Component- Trade, Hotel, Tourism, Communication Services, GDP Component - Industry, GDP Component-Manufacturing, GDP Component-Personal, Social and Community Services.

Background of Indian telecommunication Sector

The history of Indian Telecom Industry can be dated back to the year 1850 when postal was the only source of communication in India. During the year 1850, the first experimental electric telegraph line was commenced between Kolkata and Diamond Harbour. In 1851, this telegraph line was made open for the use of British East India Company. Subsequently, the telegraph lines were extended throughout India. During the year 1881, the Oriental Telephone Company Ltd. of England launched the telephone services in India by setting up telephone exchanges at Calcutta, Bombay, Madras and Ahmadabad. The telephone services were combined with the postal system in 1883. The capital of India got shifted to New Delhi in 1911 up till when Calcutta remained the Indian capital. The Public Works Department was then in charge for administering the telecom operations in India. From the year 1902 to 1930, there had been a lot of progress in the Indian Telecom Industry in the form of cable telegraph, wireless telegraph, radio telegraph and radio telephone system. Radio Broadcasting was introduced in India in 1927 which was given the name All India Radio in 1937. After the year 1947, when India attained independence all foreign telecommunication companies were nationalized to form the Posts, Telephone and Telegraph (PTT), a body governed by the Ministry of Communication. The Indian Telecom Industry was completely owned by the Government till 1984, during which year private sector was allowed to manufacture telecom equipment in this industry. The actual progression of the Telecom Industry started after the year 1985 when the Government separated the Department of

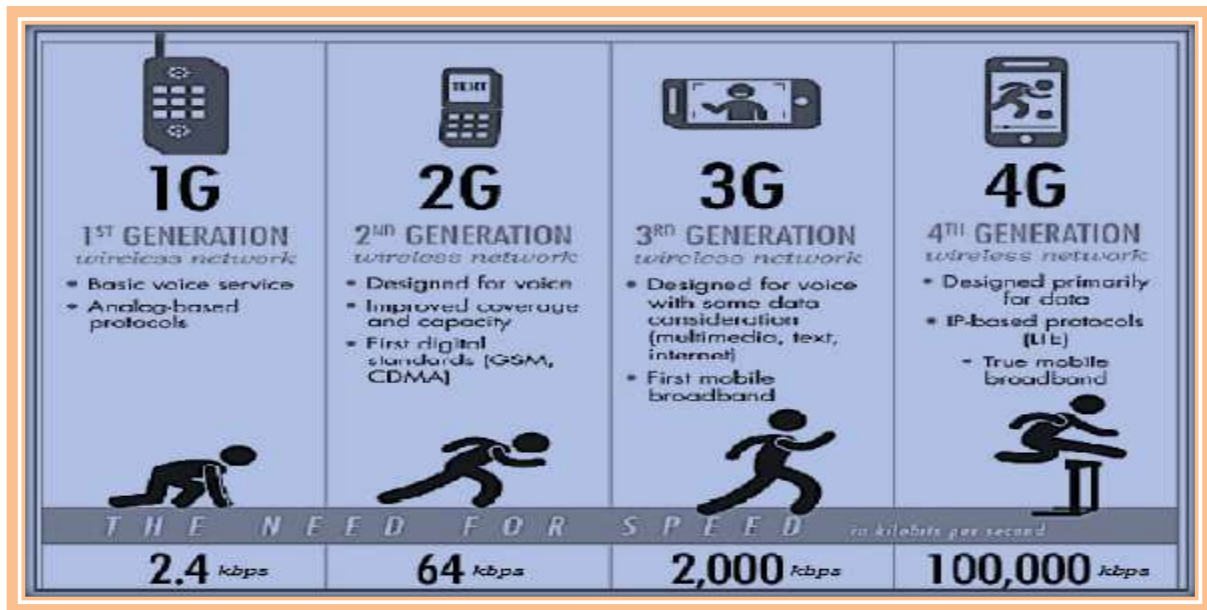
Posts and Telegraph by setting up the Department of Posts and Department of Telecommunications (DoT). DoT managed the planning, engineering, installation, maintenance, management and operations of telecom services for the whole of India. In order to make the operations of DoT easier, two new Public Sector corporations, namely Mahanagar Telephone Nigam Limited (MTNL) and Videsh Sanchar Nigam Limited (VSNL) were set up under the DoT in 1986. MTNL looked after the operation of basic telephone services in Delhi and Mumbai whereas VSNL provided international telecom services to subscribers in India. DoT looked after the basic telephone operations in areas other than Delhi and Mumbai. The demand for telephones was rapidly increasing in the 1990s and the Government was under increasing pressure to allow the private sector to invest in the Indian Telecom Industry as a part of Liberalization - Privatization - Globalization Policies. Thus, the private investment in the sector of Value Added Services (VAS) was allowed by the Government and cellular telecom sector was opened up for competition from private investments. After this period, the Government announced the National Telecommunications Policy (NTP) in 1994 which defined certain objectives, including availability of telephones on demand, provision of world class services at reasonable prices, improving India's competitiveness in global market and promoting exports, attracting FDI and stimulating domestic investments, ensuring India's emergence as a major manufacturer of telecom equipment and universal availability of basic telecom services to all villages. The entry of private service providers in the telecom industry created an indispensable need for independent regulation. The Telecom Regulatory Authority of India (TRAI) was thus, established on 20th Feb 1997 to regulate the telecom services of

India including fixation of tariffs for telecom services which were earlier regulated by the Central Government TRAI's mission was to create conditions for the growth of telecommunications in the country in a manner that would enable India to play a leading role in the global information society. In order to carry out the above objectives, TRAI has issued a large number of regulations, orders and directives from time to time to deal with issues coming before it and has helped the Indian telecommunication sector to evolve from a government owned sector to a multi-operator and multi-service open competitive market.

Further in 1998, the Government declared the policy for Internet Service Provision (ISP) by private operators and the licensing for the same had begun from then. Consequently, the Global Mobile Personal Communications by Satellite (GMPCS) was also opened up for the private operators. Although the private players had been allowed participation in many telecom service segments, the results of privatization were not satisfactory. Therefore, a New Telecom Policy (NTP-99) came into existence from 1st April, 1999. The NTP-99 emphasized upon the opening of all the segments of the telecom industry for private sector participation. It recognized the need for resolving

the prevalent problems of the operators to restore their confidence and improve the investment climate. This policy provided the much needed relief to private players who were earlier burdened with huge debts that they had to pay owing to the license fee. After this, two new departments, viz. Department of Telecom Services (DTS) and the Department of Telecom Operations (DTO) were carved out of the Department of Telecommunication (DoT) to separate the service provision and operational functions of DoT. In 2000s DoT becomes a corporation – Bharat Sanchar Nigam Limited (BSNL). The cellular services further used the technology like Global System for Mobile Communications (GSM) and Code Division Multiple Access (CDMA). Later in 2000, DTS was corporatized and renamed as Bharat Sanchar Nigam Limited (BSNL). DoT is now responsible for policy making, licensing and promoting private investments in both telecom equipment manufacturing and in telecom services. Subsequently in 2002, even VSNL was privatized and its monopoly in International Long Distance (ILD) services was terminated from 31st March, 2002. The telecom industry set its benchmarks of service quality through 2G, 3G, 4G (2016) and present revolution of 5G services in 2018.

Figure 6: Generation wise Evolution



Source: www.google.com

Ministry of Communication

Ministry of Communication controls all the operations of telecom sector in India. It is accountable for all major policy changes in telecom sector, planning, supervision, spectrum control, etc. In the strategic development of telecom industry it plays important role.

Department of Telecommunications

In 1985, the Department of Posts and Telecommunications was separated into Department of Posts and Department of Telecommunications (DoT). Till 1986, it was the only telecom service provider in India. It was also acting as a policy maker, planner, developer as well as an implementing body. DoT depends on Government of India for its development plans and financial support. Its pivotal role in the Indian telecom sector has got reduced after establishment of Telecom Regulatory Authority of India.

Telecom Regulatory Authority of India

The Telecom Regulatory Authority of India (TRAI) was established under the TRAI Act 1997. TRAI was founded to act as an independent regulatory body supervising telecom development in India. Subsequently, Broadcasting and Cable Services were also brought within the area of telecommunication service. The TRAI ensures the protection of consumers' and take care of environment for growth of telecommunications, broadcasting and cable services for facilitating India to play a leading role in the emerging global information society. TRAI is playing a role of catalyst in the development of telecom, broadcasting and cable services. It makes an effort to provide an atmosphere, which is fair and transparent, encourages competition, protects the interest of consumers and enables technological benefits to everyone. TRAI set down the standards of quality of service to be provided by the service providers, specify tariff policy and propose environment for entry of new service providers along with the terms & conditions of license to a service provider. The TRAI makes

recommendations to the government on various issues like entry of new operators in the sector, licensing framework and market structure, management of spectrum, consumer safety & security. It finalizes toll rates and settles disputes between players.

The Telecom Commission

The Telecom Commission was set up by the government of India vide notification dated April 11, 1989 with administrative and financial powers of the government of India to deal with various aspects of telecommunications. The Telecom Commission and the Department of Telecommunications are liable for policy formulation, licensing, wireless spectrum management, administrative monitoring of Public Sector Units (PSU), Research and Development etc. (Source: www.dotindia.com.)

National Telecom Policy 1994

In the 1990s, the telephone demand was ever increasing and government was in condition to open up the telecom sector for private investment as a part of Liberalisation – Privatisation - Globalisation policies that the government had to accept to overcome severe fiscal crisis and resultant balance of payments issue in 1991. Therefore, in the sector of Value Added Services (VAS) private investment was permitted and cellular telecom sector were opened up for competition from private investments. National Telecommunications policy (NTP) in 1994 brought changes in the following areas: ownership, service and regulation of telecommunications infrastructure. The policy

introduced the concept of telecommunication for all and its vision was to expand the telecommunication facilities to all the rural area of India. The National Telecom Policy (NTP) 1994 was planned to open up the Indian markets for Foreign Direct Investment (FDI) as well as domestic investment in the telecom sector. The main goal of the NTP 1994 was to increase the accessibility to telecom services. The major objectives of this policy were to make the telephones accessible when the customers will demand it by 1997, second objective was to have access of basic telephone services by 1997 to all the villages in India and the third objective was that in urban areas, provision of a PCO for every 500 persons by 1997.

New Telecom Policy in 1999

In 1999, Government issued a New Telecom Policy (NTP), to address the concerns of private sector. The progress in IT sector also needs the development in telecom infrastructure. This necessitates restructuring the telecom policy in India. The access of telecom facility is of greatest importance for accomplishment of social and economic goals of India. The telecom policy aimed to facilitate the affordable and effective communications for the society, to initiate for competitive environment in the telecom sector, to encourage expansion of telecom facilities in remote, hilly and tribal areas of the country, to enable Indian telecom companies to become actually global players.

National Telecom Policy 2012

The Government announced National Telecom Policy in 2012. The main objectives of the policy are to increase in rural tele-density to 70 percent by

the year 2017 and 100 percent by the year 2020, 175 million broadband connections by 2017 and 600 million by the year 2020 at minimum 2 Mbps download speed and making available higher speeds of at least 100 Mbps on demand. To boost investment and increase employment opportunities in the telecom sector, the government set off the NTP 2012. The unified license, merger and acquisition guidelines, clarity on spectrum pricing and auction are major initiatives under NTP 2012.

National Telecom Policy 2018

Government is in the process of formulating the new telecom policy, targeted to be released in 2017, after holding wide range of consultations with various stakeholders. The policy shall be governed by key guiding principal of alignment with national vision. The major themes that new Telecom policy shall try to address include, Regulatory and Licensing frameworks impacting the sector, connectivity for all, quality of services, ease of doing business and absorption of new technologies including 5G and IoT.

The board roadmap and guiding principles of the National Telecom policy, 2018 have been approved by telecom Commission in the meeting held on 29th September, 2017. Various Working Groups on themes viz. Digital India, New Technology, Licensing framework, make in India, infrastructure, Spectrum management, Security, Skill development and Capacity Building, Allocation and Pricing of resources, Disaster management, Customer protection, legislative framework and Strategic financial planning have been formed with telecom experts from the department and PSUs or regulatory body under it.

Foreign Direct Investment Policy in Telecom Sector

In India, Telecom sector is considered to be one of the most attractive sectors for Foreign Direct Investment (FDI). As per the present FDI policy, the FDI limit for all telecom services is 100 percent, subject to observance of licensing and security conditions by licensee as well as investors as notified by the Department of Telecommunications (DoT) from time to time.

Table 1: FDI

Year	₹ Crore	US \$ Million
2015-16	8,637	1,324
2016-17	37,435	5,564
2017-18 (April'17 to September'17)	38,926	6,084

Source: Department of Industrial Policy and Promotion

The year 2017-18 is a high point of inflows into the sector, when FDI equity inflow touched US \$ 6.08 billion in the first half of the year (i.e. April to September, 2017) a more than four-fold rise from the level of US 4 1.3 billion witnessed in the entire

FY 2015-16. The industry has attracted FDI worth US \$ 30.03 billion during the period April, 2000 to September, 2107, according to the data released by Department of Industrial Policy and Promotion (DIPP).

Table 2: A Snapshot of Evolution of Telecommunication Sector in India

Evolution of the Telecom Industry – Road Map

Month and Year	Particulars
PHASE – I	
November, 1850	The first Experimental Electric Telegraph line was started between Calcutta and Diamond Harbour
October, 1851	The Telegraph line Completed and opened for East India Company's traffic
April, 1852	Dr. O. Shanghnessy's report on Success for working of the experimental line landed before the West Bengal Government
October, 1854	The first Telegraph Act enacted
February, 1855	Electric telegraph opened to public traffic
January, 1856	First Indo- European telegraph communication effected
1857	The „Mutiny “Electric Telegraph saved India” – Dalhousie
1858	First Indo – Ceylon cable laid
1867	A new cable laid between India and Ceylon
1870	International Telegraph Conference at Berne and Rome
October, 1872	Interference to Telegraph Working by Magnetic Storm
1873	Duplex Telegraphy introduced in India between Bombay and Calcutta „Indigenous manufacture of cables for river crossing by Telegraph Workshops , Alipore
August, 1875	The first Private Telegraph line supplied by the Telegraph department
August, 1877	Indian Telegraph Department erected telegraph line between Srinagar and Gilgit on behalf of the Maharaja of Kashmir
July, 1880	I.T.D. transferred responsibility of the Ceylon Telegraph system and offices to the Ceylon Government
November, 1881	Licenses granted to private Companies to operate Telephone Systems at Madras, Bombay, Rangoon, Calcutta
28 th January, 1882	First Telephone exchange in Mumbai using Law's call wire equipment commissioned by Mumbai Telephone company at fort
October, 1885	Upper Burma Campaign- I.T.D helps in providing communications for swift advance. Introduction of Quadruples telegraphy and copper wire for transmission
1886	Copper wire for transmission between Bombay and Madras instead of iron wire
1887	Facilities afforded to Indian Meteorological Service for communicating“ Storm Signals“ to all places
1888	Post office and Telegraph Department combined as quasi – commercial department
1892-1893	All exchanges converted into Magneto Exchanges
1892-95	Construction and control of Telegraph System of Kashmir State by I.T.D
1895-96	Phonograms introduced for the first time at Bombay and Calcutta
1896	Introduction of phonogram at Mumbai
1902	First wireless telegraph station was established between Saugor Islands and Sandheads
1903	Field Telegraphs for Sikkim, Tibet, Reorganization of Superior Establishment in Telegraph, Department Wireless Telegraphs introduced
1904	Wireless Telegraph introduced between Elephant Point and Amherst
1905	Control of Telegraph Department transferred from P. W. D to Commerce and Industry Department, except for matters connected with Buildings and Electricity
1906	Baudot system introduced between Calcutta and Bombay, and Calcutta and Rangoon
1906-10	Underground cables introduced
August, 1907	Central Battery working of telephones was first introduced in Kanpur
December, 1907	Women signalers employed for the first time
1907-08	Wireless Telegraph working between Diamond Islands and Port Blair were successful during the nights of cold weather
1908	Wheatstone working between London Madras and Rangoon
1909	Wireless Telegraph Traffic was maintained with ships at-sea from Calcutta stations at Diamond Island and Table Island
April, 19010	Birth of Technical Branch as a separate organizations for dealing with the technical matters under Electrical Engineer-in-chief

December, 1910	Telegraph Department awarded a gold medal in the United Provinces Exhibition held at Allahabad
1910-11	Introduction of Circle Scheme in the department and decentralization
1912-14	Amalgamation of Postal and Telegraph Department under a single Director-General. Reversion of control of P&T again to P.W. D.
1913-14	First automatic exchange at Simla with a capacity of 700 lines with 400 actual connections
1914-18	Production of war materials by Workshops
April, 1919	Lady operators employed in Simla Exchange
1920	Madras-Port Blair route for Wireless Telegraph opened
May, 1921	Recurrence of Magnetic storm after a period of 50 years. Telegraphs Traffic in south India interrupted
August, 1921	National Cash Registers introduced in Calcutta C. T. O. for the first time
1921	Auto Exchanges were opened for the first time in India, Continuous wave transmitters for wireless telegraphy replaces the spark transmitters, Introduction of R. A. X at Poona
1922	Department erected a line for Tibetan Government from Gyantse to Lhasa
1923	Long distance dialing (90 miles) introduced between Lahore and Lyallpur. First Trunk Telephone Circuit in Burma established between Rangoon and Pegu
1924	Floods and cyclone interrupted Telegraph Traffic throughout India
1 st April, 1925	Accounts of the Department re-constituted on the basis of a full-fledged commercial unit
1925-26	Conversion of Delhi Manual system to Auto System. Delux telegraphs for greeting messages with foreign countries introduced
3 rd July, 1927	Radio-Telegraph started working between U. K. and India with important stations at Khadki and Daund. The beam station at Kirkee and Dhond opened by Lord Irwin and greetings exchanged with the King of England
1932	Automatic time announcing machine with disc records installed
May, 1933	Radio-Telegraphs communications between England and India opened by India Radio and Cable Communication Co. Special Trunk Exchanges was installed at Kirkee
December, 1936	Indo-Burma Radio-Telephone service started functioning between Madras and Rangoon
1936-37	Use of Trunk Lines for broadcasting programmes introduced
1937	Burma and Aden Telegraph Systems, which were a part of Indian Telegraph System, separated, Deluxe Telegram with foreign countries introduced
1938-39	Construction of short wave and medium wave wireless telegraph receivers in a number of stations and direction finding stations at Gaya and Allahabad
1940	Introduction of „Urgent Private Inland Trunk Calls“. Overseas Telephone Service temporarily suspended due to war conditions
1942	Bombay Australian wireless Telegraphic service inaugurated, The Bombay Telephone Workshop was taken over by the I.T.D.
February, 1942	Bombay-China Wireless Service inaugurated. Training centre at Calcutta transferred to Jabalpur
1942-47	Telecommunication Development Scheme came into operation. A Telecommunication Development Board was set up
1943	The Jabalpur Telegraph Workshop started, The Bombay, Calcutta and Madras Telephone Systems were taken over by I.T.D
August, 1944	Bombay-New York Wireless Telegraph Services was commissioned into service
September, 1944	Second civilian outlet to U.K, Delhi and London Wireless Telegraphs Service inaugurated
PHASE – II	
1947	India was represented at the important Atlantic City International Radio Conference, Direct Telephone link to Kashmir and Assam, Sri. Sardar Patel launched Jalaprabha on Telephone Carrier Channel and Wireless, Foreign Telecom companies nationalized to form PTT
1 st June, 1949	Introduction of Hindi telegram in Devanagari script
December, 1949	„Own Your Telephone“ Scheme inaugurated
1949	Wireless station commenced functioning at Srinagar
1949-50	State Merger Scheme; the P&T gradually took over the respective State P&T Systems

January, 1950	India-Afghanistan Wireless Telegraph Service inaugurated. Radio-Telephone Service between India and Nepal inaugurated
May-June, 1950	Coastal Wireless Stations at Karwar, Ratnagiri and Mangalore started
October, 1950	The Wireless Telephone Service between Indonesia and India opened
1950	Private Priority Telegram introduced, Own Your Telephone Exchanges" Scheme began to operate
December, 1950	Telegraph Wires (Unlawful possession) of 1950, Act was passed by Parliament
1950-55	Step by Step 1231tronger exchanges commissioned
March, 1951	The first Asian Games held at Delhi was conveyed by a direct Radio telephone service between India and Japan. Innovation of Radio-Telephoto Service
June, 1951	Wireless Telegraph link to Moscow
July, 1951	Wireless Telegraph and Telephone link to Egypt. First Toll Cable : Delhi – Ghaziabad
September, 1951	Wireless Telegraph and Telephone link to Iceland
December, 1951	Launching of S.S Jalapushpa of Scindia Steam Navigation Company at Vizagapatam by Shri N.V Gadgil from Bombay through telegraph link circuits. Wireless Telegraphs link to Thailand
March/August, 1952	Wireless Telephone link to Iran/Japan
1953	12 channel carrier systems introduced, First Automatic Exchanges in Calcutta. Telex Service in Bombay, First 12-Channel Carrier Systems. Introduction of Frequency Modulation. Mechanization of Telephone Revenue Accounting, A12 channel carrier system was introduced in the nation
1956-60	Central Disk tape recorder type announcement introduced
July, 1959	First Coaxial route between Delhi-Agra commissioned
November, 1960	First subscriber trunk dialing route was commissioned between Kanpur and Lucknow
December, 1965	First microwave route between Calcutta-Asansol opened
1966-70	Penta Conta Cross Bar Exchange installed for the first time in Mumbai
February, 1967	First crossbar-local exchange commissioned at Mambalam-Madras
December 1967	First crossbar trunk automatic exchange out into service at Madras.
March 1975	First PCM system between city and Andheri telephone exchanges commissioned in Mumbai. „Advanced Level Telecom Training Centre" commenced training activities from Delhi to be eventually shifted to its own campus in Ghaziabad
1976	Installation of SPC gateway telex exchange and introduction of International subscriber dialed telex service. First Digital Microwave System introduced in Calcutta Junction network, First digital micro wave junction was introduced
1978	Introduction of Press Bulletin Service (PBS). „Telecommunications Consultants India Limited" set up in the public sector to provide consultancy services in telecommunications.
1978-79	C-400 Hitachi crossbar commissioned on 26-5-78 at Malabar Hill.
1979	First optic fibre system for local junction commissioned at Pune.
PHASE – III	
1980	First satellite earth station for domestic communications established at Secunderabad (U.P)
1980's the beginning	Tele-density in 1980-81 -0.3 per cent, Introduction of public pay phones, Private sector allowed, DOT, MTNL and VSNL formed
1980	First satellite earth station for domestic communications was established at Secunderabad
1981	Troposcatter system link between India and U.S.S.R. inaugurated.
1982	First SPC electronic digital telex exchange commissioned at Bombay.
1983	First analog stored program control exchange for trunk lines was commissioned at Mumbai
1984	Manufacturing of subscriber terminal equipment opened to private sector
1984	Centre for Development of Telematics (C-DOT) was established as a society for development of digital switching system. C- DOT was established for indigenous development and production of digital exchanges
1985	Telecom was constituted into a separate department with a separate board
1985	First Mobile Telephone Service introduced on non- commercial basis in Delhi. First

	Radio Paging introduced in Delhi.
1985-1986	Navi Mumbai Telecom District formed on 1-4-85
1986	On 1-4-86 MTNL was formed and Videsh Sanchar Nigam Limited" was established.
1987	First digital coaxial 140 Mb/s between Ahmedabad and Rajkot commissioned.
1987-88	Large Scale introduction of Push Button instruments
1988	International gateway packet switch system commissioned at Bombay.
1988-89	Phone plus services introduced for subscriber number connected with Electronic exchanges.
1989	Telecom Commission formed
PHASE – IV	
Early to mid 90's	Telecom Policy 1994, Basic Telephony service to Private operators, 49 per cent FDI, 8 Licensees began operations in August 1995
Late 90's	Birth of a regulator: TRAI, NTP 1999 (New Telecom Policy)
1991	I-Net exchange commissioned. Inmarsat costal earth station at ARVI to provide maritime communication. Voice Mail Service (VMS) introduced in Delhi.
1991	Telecom equipment manufacturing opened to private sector. Major international players like Alcatel, AT&T, Ericsson, Fujitsu, and Siemens entered equipment manufacturing market
1992	VAS sector opened for private competition
1993	Private networks allowed in Industrial areas
1994	Announcement of National Telecom Policy , Cellular telephone service started in Calcutta and Delhi, Internet service provided by VSNL, ISDN service started commercially
1994	Licenses for radio paging (27 cities) issued
May, 1994	New Telecom Policy Announced
September, 1994	Broad Guidelines for private operator entry into basic services announced.
November, 1994	Licenses for cellular mobiles for four metros issued
1995	The "Telecom Regulatory Authority of India" was set up, Wireless in Local Loop (WLL) telephone system introduced in MTNL. Delhi, Basic Telecom services opened for private competition
1995-96	Usage of automatic number announcement service introduced. Interactive fault repair service introduced.
1996-97	ISDN services introduced commercially. Auto com service introduced
1998	New ISP policy was announced
1998-99	MTNL became an ISD
1999	The service providing arms of the DOT separated from the policy making and licensing function, A new Telecom Policy was formulated, National Long Distance market thrown open for competition, Wireless planning and co-ordination committee created to review and enforce spectrum allocation policy, Lowered the license fee. The government changed the prevailing fixed annual license fee to a revenue share regime, DOT is separated into two organs- DTS and DTO
1999-2000	MTNL Mumbai crossed the 2 million mark in subscriber base. MTNL became 100 per cent electronic
PHASE – V	
January, 2000	Amendments made to the TRAI Act.
August, 2000	Announcement of Domestic Long Distance Competition Policy
October, 2000	Planned Corporatization of DoT
2000	Telecom disputes, Settlement and Appellate Tribunal were established, National Long Distance Service opened for private competition, Bharat Sanchar Nigam Limited is born on 1 st October.
2000-01	MTNL launched its GSM service under the Brand Name "Dolphin" on 27 th February, 2001
2001	Convergence Bill to promote, facilitate and develop the carriage and content of communications tabled in the parliament, Policy for GMPCS service has been announced, Policy for PMRTS has been announced, Policy for UMS was announced
2001-02	MTNL got listed at New York Exchange on 6-11-2001.

2002	VSNL came under private management, International Long Distance Service opened for private competition, Internet telephony was started
2002-03	TRAI adjudged MTNL as “Best Telecom Service provider” Prepaid service under the Brand Name of “Trump” has been launched simultaneously in Mumbai & Delhi on 14-1-2002
2003	Paved the way for a calling party pays (cpp) regime. Subscriber no longer had to pay for incoming calls, making the mobile phone highly affordable to the low usage customers who mainly used it for incoming calls. (Inter connect usage charges regime), The termination charges made uniform for all types calls- cellular mobile, fixed and WLL(m); Allowed an operator to provide fixed and / or mobile service using any technology. (Unified License); The first phase of implementation, the unified Access service license was readily adopted by most of the major operators.
2003-04	MTNL becomes No:1 in Internet Service provider in Delhi and Mumbai
2005	FDI 74 per cent, The per minute Access Deficit charge on domestic long distance calls reduced by up to 60 per cent and the ADC on international calls by up to 40 per cent, Union Budget 2003-04 cut the customs duties on telecom sector capital goods from 25 per cent to 15 per cent and on cell phone’s from 10 per cent to 5 per cent Union Budget 2004-05 exempted imports of capital goods for manufacture of mobile handsets from customs.
2006	The per minute ADC for domestic calls replaced with a revenue share fee of 1.5% of non-rural (wire line) AGR, coupled with a sharp 60 percent drop in per minute ADC on international calls.
2007	ADC on per centage revenue share reduced to 0.75 percent from 1.5 percent of AGR. Per minute ADC on outgoing international calls reduced to zero, and on incoming international calls reduced to Rs.1, Roaming rental reduced to zero. Reduction of roaming tariffs to the extent of 22 -56 percent, Port charges reduced by 23-29 percent
2007-2011	Having the world’s lowest call rates the fastest growth in the number of subscribers (45 million in 4 months); The fastest sale of million mobile phones (in a week); The world’s cheapest mobile handset; The world’s most affordable colour phone
2014	Recommended by telecom regulator TRAI on spectrum sharing

Source: *Compiled from various reports and publications of DOT, BSNL and Government of India*

Limitations

Due to time constraint this research review empirical study has been made on the basis of previous data i.e. secondary data. Those research gaps are huge and to be helped the future researcher when research on this topic. This study may be up-dated and redesigned by considering the latest available data. There is a lot of scope for further researches on this issue by considering other factors which I have not considered in my present empirical study, it would have been more. However, all possible effort has been made to make the study successful.

Section – II

Findings

It is evident that Telecommunication sector holds immense opportunities across entire India and below listed findings will help the industry take the speedy path towards growth:

- ✓ Penetration of rural markets (72 percent of population staying in rural areas) will be the key growth driver.

- ✓ As on November, 2017, the fibre has reached 103,275 gram panchayats with the laying of 238,677 km. of optical fibre cable. The second phase of the program has an outlay of Rs 30,920 crore that will connect 1.5 lakh gram panchayats through high speed broadband, is likely to be completed by March 2019.

- ✓ Divestment of tower assets into separate companies will enable curb costs and focus on core operations.
- ✓ Introduce new and efficient technologies such as M2M and cloud computing.
- ✓ TRAI has also recommended new policy on net neutrality which prohibits discriminatory tariffs for data services, where service providers are restricted from entering into any arrangement, agreement, or contract, with any person, natural or legal, that has the effect of discriminatory treatment based on content, sender or receiver, protocols or user equipment. The government is yet to take a final call on the policy, but the minister recently said that the government's views were in tandem with those of the regulator.
- ✓ Benefits of industry status in line with other infrastructure sectors in the country to be implemented.
- ✓ Explore the option of revenue sharing agreement between Internet players and telecommunication companies.
- ✓ Development of Telecommunication infrastructure.
- ✓ Telecom Minister Manoj Sinha told ET recently that the policy would also look at

some fundamental issues related to stress in the sector, that have not been addressed by the inter-ministerial group (IMG) suggestions to give a one-time option to carriers to make annual payments for spectrum bought in auctions, over 16 years rather than 12 years at present. IMG had also suggested reduction in interest rate on penalties.

- ✓ While highlighting reduced revenue and irrational spectrum costs, the survey also underlined that the 'crisis' being faced by telcos has also deeply impacted their investors, lenders, partners and vendors, even as it underscored government programs of Bharat Net and Digital India that were enabling India to become digitally connected.
- ✓ The newest entrant in Indian telecom sector Reliance Jio started offering free data and voice calls from September 5, 2016 and since then has been able to garner a subscriber base of more than 160 million users as of December 2017. Jio's plans lead to a tariff war between incumbent carriers including Bharti Airtel, Vodafone India and Idea Cellular, with Jio, which resulted in free voice calls for customers coupled with dollops of free data, but eroded revenue for the older carriers.

Figure 7: Indian Telecommunication Sectors' Domestic Revenues & Subscriber Growth



Source: www.google.com

The total number of wireless subscribers counts to 1,183.41 million at the end of March 2018.

Table 3: Mobile Network Operators in India

Rank	Operator's Name	Technology	Subscribers (in millions)	Share Market	Ownership
1	Vodafone, Idea	Vodafone India- GSM-900/1800 (EDGE) 2100 MHz UMTS, HSPA+ LTE Band 3 (1800 MHz), LTE Band 41 (2500 MHz), Idea Cellular - GSM-900/1800 (EDGE) 2100 MHz UMTS, HSPA+ LTE Band 3 (1800 MHz) VoLTE	Vodafone India - 222.03 Idea Cellular- 216.76	Vodafone India - 18.82% Idea Cellular - 17.85%	Vodafone Group (45.1%) Aditya Birla Group (26%) Axiata Group Berhad Providence Equity (28.9%)
2	Airtel - Tata Docomo - Airtel Telenor ^[4]	GSM-900/1800 (EDGE) 2100 MHz UMTS, HSPA+. LTE Band 3 (1800 MHz), LTE Band 40 (2300 MHz), LTE Advanced VoLTE	Airtel - 346.67 Tata Docomo - 31.24	Airtel - 28.91% Tata Docomo - 2.64%	Bharti Enterprises (64%) SingTel (36%)
3	Reliance Jio	LTE Band 5 (850 MHz), LTE Band 3 (1800 MHz), LTE Band 40 (2300 MHz), LTE Advanced VoLTE	Jio- 186.56 RCom- 0.24	Jio- 15.76% RCom- 0.02%	Reliance Industries
4	BSNL Mobile - MTNL	GSM-900/1800 (EDGE) 2100 MHz UMTS, HSPA+CdmaOne, EVDO WiMAX WiFi LTE Band 5 (850 MHz), LTE Band 3 (1800 MHz), LTE Band 40 (2300 MHz), GSM-900 MHz (EDGE) 2100 MHz UMTS, HSPA	BSNL-111.71 MTNL-3.56	BSNL- 9.44% MTNL- 0.30%	State-Owned
5	Aircel (Bankrupt)	GSM-900/1800 (EDGE) 2100 MHz UMTS, HSPA+ 2300 MHz TD-LTE	74.20	6.27%	Maxis Communications (74%) Sindya Securities and Investments (26%)

Source: Wikipedia

Note:

- ✓ Airtel has acquired Telenor India and Tata Teleservices.
- ✓ Vodafone and Idea have got NCLT nod for merger.
- ✓ Reliance Communications and its subsidiaries plan to exit the insolvency process and pare debt of 46,000 crore by selling assets including towers, fibre network and spectrum to Reliance Jio.
- ✓ Aircel has filed for bankruptcy in NCLT under RBI norms.

The total numbers of wired subscribers in India are 22.81 million as on 31st March 2018.

Table 4: Land Line operators

Rank	Operator's Name	Subscribers (in millions)	Market Share	Ownership
1	BSNL	12.267	53.78%	State-owned
2	AirTel	3.932	17.24%	Private
3	MTNL	3.347	14.67%	State-owned
4	Tata	1.876	8.22%	Private
5	Reliance	0.923	4.05%	Private
6	Quadrant	0.244	1.07%	Private
7	Vodafone	0.221	0.97%	Private

Source: Wikipedia

Reliance Jio in September 2016, the telecom market saw a huge change in terms of falling tariff rates and reduction of data charges, which changed the economics for some of the telecom players. On 12th October 2017, Bharti Airtel announced that it would acquire the consumer mobile businesses of Tata Teleservices Ltd (TTSL) and Tata Teleservices Maharashtra Ltd (TTML) in a debt-free cash-free deal. The deal will essentially be free for Airtel which will only incur TTSL's unpaid spectrum payment liability. TTSL will continue to operate its enterprise, fixed line and broadband businesses and its stake in tower company Viom Networks. Reliance Communications had to shut down its 2G and 3G services including all voice services and only offer 4G data services from December 29, 2017, as a result of debt and a failed merger with Aircel. Surprisingly, the shutdown was shortly after completion of acquisition of MTS India on 31st October 2017. Aircel shut down its operations in unprofitable circles including, Gujarat, Maharashtra, Haryana, Himachal Pradesh, Madhya Pradesh and Uttar Pradesh (West) from 30th January 2018. Aircel along with its units - Aircel Cellular and Dishnet Wireless on 1st March 2018, filed for bankruptcy in the National Companies Law Tribunal (NCLT) in Mumbai due

to huge competition and high levels of debt. Telenor India is planned to be acquired by Airtel almost without any cost, subject to regulatory approval. Vodafone and Idea Cellular signed a deal in March 2017 that the company will merge in an all stock deal, creating a single entity which will be India's largest telecommunication company. The merger will create the largest telecom company in India by subscribers and by revenue. Under the terms of the deal, the Vodafone will hold a 45.1 percent stake in the combined entity, the Aditya Birla Group will hold 26 percent and the remaining shares will be held by the public. Both networks will continue to carry their own independent brands post merger. The merger is expected to be completed by March 2019.

Epilogue

The overall results of causality indicate a long run relationship between telecommunications and economic growth at aggregate level as well as at sectoral level. Tele-density has a significant role to play in the growth of various sectors of the economy. In today's era of globalization and privatization, Information and communication technologies are being used in services sector (including finance, business services, trade). The

telecommunications infrastructure and its related services are a major source of economic development. Through the empirical study researcher found that there is significant positive correlation between tele-density growth and GDP growth, significant negative correlation between tele-density and number of people below poverty line, significant positive correlation between tele-density growth and literacy rates and significant positive correlation between tele-density growth and Electricity. However, the direction of causality is different from case to case. In case of GDP per capita, direction of causality is from tele-density to GDP which reveals that telecommunications contribute to overall economic growth. In addition to it, in case of industry, there is no causality. In the case of manufacturing, there is bi-directional causality. Further the case of services indicates the direction of causality from services to tele-density i.e. all the services using telephone facilities in one-way or other are contributing to the growth of telecommunications. Next is the case of FIRB services, the results indicate causality from FIRB services to tele-density which reveals that finance, Insurance and business services contribute to the growth of tele-density. Further, the case of TTHC services shows causality from TTHC services to telecommunication indicating cause and effect relationship between the two sectors. Last is the Social, personal and community (SPC) services whereby direction of causality is from tele-density to SPC services.

It can be concluded that the Indian Telecom Industry contributes significantly to the overall socio-economic development of India. It is an essential tool for the growth of the nation. The various telecom service providers offer voice and data services to the customers across different regions of the country including both urban and

rural areas thereby facilitating the growth of this industry.

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