SUPPLY CHAIN DYNAMICS AND CHALLENGES OF INDIA’S TELECOM INDUSTRY

The telecom industry development has been one of the most remarkable development stories in Indian history. In last 20 years from a nascent stage this industry has been indistinguishably interweaved into practically every characteristic of an individual’s life. Purpose of this chapter to review the current dynamics of telecom sector and its supply chain. The chapter explains profile of telecom industry’s dynamics, its challenges and supply chain dynamics of industry. It elaborates spread of telecom sector in India, relationship matrix of multiple constituents in supply chain of the sector, key players, regulatory framework of the sector in country, and telecom equipment manufacturing scenario. Further on the chapter explains major governing factors in telecom sector, challenges being faced by the telecom sector and ecosystem challenges prevailing in the country.

Industry had provided implements or applications resulting into efficient processes which earlier would have taken days or weeks. Industry is now expanding its wings into another industries such as software development, content driven industries like music, movies, media, gaming, banking, education, and health sector. The influence that the telecom industry has had on the Indian economy and day-to-day life in general is echoed in the astonishing spread of telecom technology around the country. According to a recent study Indian smart phone users now spend 191 minutes per day on smart phones compared to 128 minutes watching TV. (Ericsson Consumer Lab, 2014) According to a Telecom Regulatory Authority report there were 904.51 million wireless telecom subscribers in the country in March’2014. (Telecom Regulatory Authority of India, 2014)

Universality of telecom has had a deep influence on human lives and organisations. In addition to flexibility of speaking to everyone from any location
worldwide, wireless phones / devices have produced new opportunities for consumer to explore data in form of media news, games, and subscription of books, magazines, utilities, music, and movies. Organisations have been able to restructure their ways of working due to better communication facilities like video conferencing and cloud computing. These have resulted into major cost saving to companies in the form of reduced travel cost, reduce system hardware cost and reduced infrastructure availability due to flexibility of working from anywhere. Telecom sector is playing a key role in economic and social development of the country. In fact, aiding to human social connects through availability of social applications such as Facebook, WhatsApp any time anywhere. Mobile money, mobile health, electronic learning and mobile education are few other applications being worked on the base of telecom sector resulting into access to money, health consultation and effective, economical education of any of the global field of education to remotest part of country. The web based age has also facilitated an unrestricted and quick data availability resulting in effective usage of resources hence, improves the profitability of organisations. In order to meet the consumer or organisation’s requirement for the output from above said functions it is must that telecom sector is supported by its infrastructure of networks, hardware/software environments and regulatory guidelines. If the infrastructure of sector is managed properly then only it can manage industry dynamics.

3.1 SPREAD OF THE TELECOM SECTOR

Country wide wireless telecom territory (Figure 3-1) across India has been divided into number of regions called telecom circles or telecom service area. In case any telephone operator wants to operate in a specific telecom circle it need to secure a license to operate for that circle which is mainly secured through an auction process carried out under ministry of telecom along with ministry of finance. There are 22 telecom circles in India. These telecom circles are grouped under four major categories as Metro, A, B and C as mentioned in Table 3-1. Chennai which was part of metro circles was integrated with Tamil Nadu with effect from 31 March 2008. The coverage of India's 22 telecom circles mostly corresponds to the borders of the Indian states with few exceptions based on area and other demographic parameters.
Table 3-1 Category Wise Circles (India Calling Info, 2014)

<table>
<thead>
<tr>
<th>Metro Circle</th>
<th>A Circles</th>
<th>B Circles</th>
<th>C Circles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumbai</td>
<td>Andhra Pradesh</td>
<td>Harayana</td>
<td>Assam</td>
</tr>
<tr>
<td>Delhi</td>
<td>Gujarat</td>
<td>Punjab</td>
<td>Bihar</td>
</tr>
<tr>
<td>Kolkata</td>
<td>Karnataka</td>
<td>Rajasthan</td>
<td>Himachal Pradesh</td>
</tr>
<tr>
<td></td>
<td>Maharashtra</td>
<td>Uttar Pradesh (East)</td>
<td>Jammu &amp; Kashmir</td>
</tr>
<tr>
<td></td>
<td>Tamil Nadu</td>
<td>Uttar Pradesh (West)</td>
<td>North East</td>
</tr>
<tr>
<td></td>
<td></td>
<td>West Bengal</td>
<td>Orissa</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kerala</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Madhya Pradesh</td>
</tr>
</tbody>
</table>

These circles are prima facie aligned with political map of India however; along with geographical area, population is also considered as one of parameters to define these telecom circles and there are numerous and varying types of exceptions. For instance some smaller states are folded into larger neighbouring states while some others are combined together to form one circle, such as states of Uttar Pradesh and Uttarakhand are divided into two areas U.P. East and U.P. West. (Figure 3-1)

![Figure 3-1 Telecom Map of India](image)

(India Calling Info, 2014)
Circle North-east constitutes six political states of eastern India. Metro circles are country’s three largest cities of the country and these are having dense population. A category circles cover areas that contain one or more very large cities such as Bangalore in Karnataka, Chennai in Tamil Nadu. Among A, B, C circles A category circles are largest in terms of population coverage. B circles cover areas that contain mid-sized urban areas and larger towns. C circles cover areas that are largely rural and contain the smallest population.

3.2 RELATIONSHIP MATRIX IN SUPPLY CHAIN

The telecommunications supply chain originates with sourcing of components like semiconductor chips and software. Components supplied by components’ suppliers (C1-C6) are incorporated into telecom equipment manufactured and supplied by equipment vendors (E1-E4) purchased by telecom service providers (NO 1).

![Figure 3-2 Supply Chain Relationship Matrix](image)

In present time of telecom market upsurge globally, order books of these component and equipment suppliers are over booked and customer who forecasts
timely or pay premium gets maximum supplies. The telecom service providers then use this equipment to build new networks with the services of installation, infrastructure and logistics service providers (S1-S3). Telecom service providers provide services to the end users and charge them with the services of billing software providers. In the course of provision of services to end users telecom service providers takes services of equipment, infrastructure and logistics service providers for maintaining their existing network. With the advent of new technologies and due to cease of service support for obsolete equipment or components telecom service providers need to renew their network resulting into huge amount of electronic scrap getting generated. These electronic scraps need to be disposed in environment friendly manner through recyclers (R).

3.3 KEY PLAYERS IN INDIAN TELECOM SECTOR

The telecom sector in India is one of the rapidly growing sectors in the world and has also developed the second largest communication network. With opportunities of stupendous growth in this sector, it has got presence of global as well as indigenous players. The growth story and the potential have also served to attract newer players in the industry, with the result that the intensity of competition has kept increasing. As understood in Section 3.2 supply chain of the sector starts with components suppliers and constitutes telecom equipment manufacturer, telecom and logistics service providers, network service providers, software providers, infra-structure service providers and recyclers. Most of these constituents are global players and majority of these global players in telecom equipment, components and network providers’ categories are having origins outside the shores of the country. With prospects of future growth in the country and the stagnancy in the other global markets, more and more overseas players are exploring opportunities to leverage the likely growth of the country’s telecom scenario. All these constituents of telecom supply chain are connected with each other with their complex contracts and their ways of working. Following are major players in relationship matrix of sector as exhibited in Figure 3-3:
Figure 3-3 Interrelationship between Major Corporate Players in Telecom Supply Chain in India

(Telecom Regulatory Authority of India, 2015)
a. Service Providers / Network Operators

Network operators in 22 telecom circles operate over multiple technologies. Major technologies in which they operate is 2nd generation GSM (Global system for Mobile communications) (2G), 3rd generation GSM (3G), WCDMA (Wideband Code Division Multiple Access) and 4th generation Long Term Evolution (LTE).

Figure 3-4 Mobile Subscriber Base in India (2000-15)

(Telecom Regulatory Authority of India, Multiple reports)

Few operators like Sistema Shyam, Reliance communication and Tata DoCoMO etc. are also operating on older CDMA (Code Division Multiple Access) and fixed wire line technology. The core telecom service providers are Aircel, Airtel, Idea, Vodafone, Videocon, Loop, Spice, Reliance Communications, HFCL, Tata Tele, Telewings, Bharat Sanchar Nigam Limited (BSNL), Mahanagar Telecom Nigam Limited (MTNL) and Sistema Shyam Telecom. These telecom providers are associated with each other with two non-regulatory bodies - Cellular Operators Association of India (COAI) and Association of Unified Telecom Service Providers of India (AUSPI). With total 1009 million subscribers (983 million Wireless subscribers) nationwide telecom sector had achieved a tele-density of 80 per cent overall in July-15 with urban tele-density of 151 per cent and that of rural was on 48
per cent. Growth in rural sector where opportunity exists is only 5 per cent resulting into reduction of overall growth rate.

![Wireless Tele-density, 2014-15](image)

**Figure 3-5 Wireless Tele-density, 2014-15**
(Telecom Regulatory Authority of India, 2014) (Telecom Regulatory Authority of India, 2015)

Operator wise technology, subscriber, ownership, market share data is as mentioned in below (Table 3-2) Following are major telecom network operators who are contributing to development of telecom sector in India:

i. **Bharti Airtel Limited**

Bharti Airtel Limited is also known from its brand name Airtel, is an Indian multinational telecom services company having its registered office in New Delhi, India. (Bharti Airtel Limited Profile, 2014) Bharti Airtel functions in 20 countries across India, Srilanka, Bangladesh, Seychelles, Africa and the Channel Islands. In India the company's product offerings include 2G, 3G and 4G wireless services, mobile commerce, fixed line services, high speed DSL broadband, IPTV, DTH, enterprise services including national and international long distance services to carriers. In the rest of the geographies, it offers 2G, 3G wireless services and mobile commerce.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Operator's Name</th>
<th>Technology</th>
<th>Subscribers (July-15)</th>
<th>Ownership</th>
<th>Market Share</th>
<th>Circle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2G</td>
<td>3G</td>
<td>4G-LTE</td>
<td>CDMA</td>
<td>Wireline</td>
</tr>
<tr>
<td>1</td>
<td>Bharti Airtel (along with Bharti Hexacom Limited and Loop Mobile)</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>25,16,70,409</td>
</tr>
<tr>
<td>2</td>
<td>Vodafone</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>18,54,49,076</td>
</tr>
<tr>
<td>3</td>
<td>Idea cellular</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>16,27,59,491</td>
</tr>
<tr>
<td>4</td>
<td>Reliance Communications</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>11,04,42,535</td>
</tr>
<tr>
<td>5</td>
<td>BSNL</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>7,78,36,484</td>
</tr>
<tr>
<td>6</td>
<td>Airtel</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>8,33,64,687</td>
</tr>
<tr>
<td>7</td>
<td>Tata DoCoMo Virgin Mobile India</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>6,17,15,497</td>
</tr>
<tr>
<td>8</td>
<td>Televish</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>4,71,62,774</td>
</tr>
<tr>
<td>9</td>
<td>Sistema Skyam Telesevices Limited</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>86,18,452</td>
</tr>
<tr>
<td>10</td>
<td>Videocon</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>77,23,581</td>
</tr>
<tr>
<td>11</td>
<td>MTNL</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>35,70,142</td>
</tr>
<tr>
<td>12</td>
<td>Quadrant</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>28,94,530</td>
</tr>
</tbody>
</table>

**Total** |          | 98,25,68,668 | 2,61,04,333 | 1,06,93,33,001 | 1,609.31 | 100% |
Airtel is the world's fourth largest mobile telecommunications company by subscribers' numbers with over 324 million subscribers across 20 countries as of March, 2015 and it crossed the 300 million subscribers in June 2014. (Bharti Airtel Limited, 2015) Company began operations in 1995, reached the 100 million customers mark in 2009 and crossed the 200 million mark in 2012. Out of these 296 million subscribers major portion come from wireless mobile operations in India (205.5 million) and international (78 million). Balance is contributed by Tele-media (3.36 million) and Digital TV Services (9.01 million) (Bharti Airtel History, 2014) It is the largest wireless service provider in India with 23.30 per cent market share in July-2015. Airtel is the second largest in-country mobile operator with subscriber base behind China Mobile.

Figure 3-6 Bharti Airtel Revenue FY15
(Bharti Airtel Limited, 2015)

Airtel is the largest provider of mobile telephony and third largest provider of fixed telephony in India and is also a provider of broadband and subscription television services. It offers its telecom services under the "Airtel" brand, and is headed by Sunil Bharti Mittal. Wireless operations in India contribute to 52 per cent of their revenue followed by wireless operations in other countries over the globe contributing to 29 per cent of their revenue (Figure 3-6). Rest of business streams
such as infra, tele-media and digital TV business contributes to another 29 per cent of their revenue. The company has a submarine cable landing station at Chennai which connects the submarine cable connecting Chennai and Singapore. Airtel is credited with pioneering the business strategy of outsourcing all of its business operations except marketing, sales and finance and building the 'minutes factory' model of low cost and high volumes. The strategy has since been adopted by several operators. Its network base stations, microwave links maintained by Ericsson, Huawei and Nokia Solutions Network whereas IT support is provided by IBM and transmission towers are maintained by another company Bharti Infratel Ltd. and Indus Towers in India.

ii. Vodafone India Limited

Vodafone India Limited formerly Vodafone Essar Limited is the second largest mobile network operator in India after Airtel in subscriber base. It is based in Mumbai, Maharashtra. (Vodafone India History, 2014) It has approximately 186 million customers as of July-2015. Original company in India started with Hutchison Max Telecom Ltd. (HMTL) which was a joint venture between Hutchison Whampoa and the Max Group and was established on 21 February 1992. Hutchison Max rebranded Max Touch as Orange on 14 February 2000 thus introducing the Orange brand to India. HMTL was renamed Hutchison Essar Limited (HEL) in August 2005. The consolidation led to the introduction of a single brand name Hutch across all the circles in the country in which Hutchison Essar operated ending the use of earlier brand names like Celforce in Gujarat and Command in Kolkata. However, the Orange brand continued to be used in Mumbai until January 2006 when it was replaced by the Hutch brand. In February 2007 Vodafone acquired the controlling interest of 67 per cent held by Li Ka Shing Holdings in Hutch-Essar for US$ 11.1 billion. The whole company was valued at US$ 18.8 billion. The transaction closed on 8 May 2007. In July 2011 Vodafone group bought out 33 per cent stake of its partner Essar from its Indian mobile phone business and paid US$ 5.46 billion in the Indian subsidiary. With this Vodafone raised their stake to 74 per cent of the Indian business while the other 26 per cent is owned by Indian investors in compliance with Indian law. In April 2014 India based
Piramal Group sold its 11 per cent Stake in Vodafone India to Prime Metals an indirect subsidiary of Vodafone Group.

Vodafone is entangled in a US$2.5 billion tax dispute with the Indian income tax department over its purchase of Hutchison Essar Telecom services in April 2007. It was being alleged by the Indian tax authorities that the transaction involved purchase of assets of an Indian company and therefore the transaction or part thereof was liable to be taxed in India. Vodafone India offers both prepaid and post-paid GSM cellular phone coverage throughout India with good presence in the metros. Vodafone India provides 2.75G services based on 900 MHz and 1800 MHz digital GSM technology. Vodafone India launched 3G services in the country in the January to March quarter of 2011 and has expanded its base in India from 147 million in Dec-12 to 186 million in July-15.

iii. **Idea Cellular Limited**

Idea Cellular is an Aditya Birla Group Company. Tata Cellular which was providing mobile services in Andhra Pradesh and Birla-AT&T which was providing services in Maharashtra and Gujarat merged to form Birla-Tata-AT&T in year 2000 popularly known as Batata. Company was later named as IDEA. Batata acquired RPG's operations in Madhya Pradesh and the license to be the fourth operator in Delhi was clinched. In 2004 Idea bought over the Escorts group's Escotel gaining Haryana, Uttar Pradesh (West) and Kerala and licenses for three more circles UP (East), Rajasthan and Himachal Pradesh. In 2005 AT&T sold its investment in Idea and the year after Tatas also bid good bye to pursue an independent telecom business. Idea was left only with one promoter the AV Birla group. 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 per cent stake in Idea. This stake was bought by both the Tatas and Birlas at 16.45 per cent 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. On 10 April 2006, the Aditya Birla Group announced its acquisition of the 48.18 per cent stake held by the Tatas. Currently
Aditya Birla Group holds 49.1 per cent of the total shares of the company. Malaysia based Axiata controls a 14.99 per cent stake in the company. Idea is a pan-India integrated GSM operator is offering 2G and 3G services and has its own national and international long distance operations and ISP license. With revenue in excess of US$ 4 billion, market share of nearly 16 per cent and subscriber base of over 163 million in July 2015 Idea is India’s 3rd largest mobile operator. (Idea Cellular History, 2014)

iv. **Reliance Communications Limited**

Reliance Communications is Reliance Group’s flagship company with over 111 million subscribers in July 15. It has established a pan-India high-capacity integrated (wireless and wire-line) convergent (voice, data and video) digital network to offer services spanning the entire telecom value chain. Services include broadband, national and international long distance services and data services along with an exhaustive range of value-added services and applications. Reliance Mobile (formerly Reliance India Mobile), launched on 28 December 2002 and renamed later on as Reliance communications. With subscriber base of over 11 million in July 2015 RCOM is India’s 5th largest mobile operator. (Reliance Communications History, 2014)

v. **Bharat Sanchar Nigam Limited**

Bharat Sanchar Nigam Limited (BSNL) is state-owned telecom company based in New Delhi, India. It was incorporated on 15<sup>th</sup> September 2000. It acquired the business of providing telecom services and network management from state owned Departments of Telecom Services (DTS) and Telecom Operations (DTO) with effect from 1 October 2000. BSNL is the largest provider of fixed telephony and fifth largest mobile telephony provider for 2G and 3G services in India. It also provides broadband services. In recent years the company's revenue and market share plunged into heavy losses due to intense competition and reduced capital expenditure budgets in the Indian telecom sector. BSNL is India's oldest and largest communication service provider. It has footprints throughout India except for the metro cities of Mumbai and New Delhi which are managed by Mahanagar
Telephone Nigam (MTNL). With subscriber base of over 94 million in July 2015 BSNL is India’s 5th largest mobile operator. (Bharat Sanchar Nigam Limited, History, 2014)

vi. **Aircel Limited**

Aircel is an Indian mobile network operator based in Chennai which offers voice and data services ranging from post-paid and prepaid plans, 2G and 3G services, Broadband Wireless Access (BWA), Long Term Evolution (LTE) to Value-Added-Services (VAS). In 2006, Aircel was acquired by Malaysia’s biggest integrated communications service provider Maxis (Maxis Communication Berhard) and is a joint venture with Sindya Securities and Investments Pvt Ltd. Maxis holds 74 per cent equity in the company. Aircel commenced operations in 1999 by Chinnakannan Sivasankaran and today is the one of the leading mobile operator in its operating circles. With subscriber base of over 83 million in July 2015 Aircel is India’s 6th largest mobile operator. Aircel also provides international long distance (ILD) and national long distance (NLD) telephony services. (Aircel History, 2014)

vii. **Tata DoCoMo Limited**

TATA DoCoMo is part of the Indian conglomerate Tata Group. TATA DoCoMo is a cellular service provider on the GSM, CDMA platform. It is a joint venture between Tata Teleservices and NTT DoCoMo since November 2008. With subscriber base of over 63 million in July 2015 Tata DoCoMo is India’s 7th largest mobile operator. The company received the license to operate GSM services in nineteen telecom circles and was allotted spectrum in eighteen of these circles and launched GSM services on 24 June 2009. Tata DoCoMo offers both prepaid and post-paid cellular phone services. On 20 October 2011, the Tata Group brought its brands CDMA, GSM, Walky (Fixed Wireless Phone), Photon, INTERNET under the Tata DoCoMo name. All subscribers to these services were migrated to the DoCoMo brand on 20 October 2011. The company’s other brands Virgin Mobile and T24 are not part of the rebranding and continue to retain their names. (Tata DoCoMo History, 2014)
viii. Telewings Communications

Telewings Communications (brand name Uninor) is an Indian mobile network operator based in Gurgaon, Haryana, India. The company is a subsidiary of Telenor group a telecommunications company headquartered in Oslo, Norway and Telenor currently owns 74 per cent of the stake in Telewings Communications. Telewings offers mobile voice and data services based on the GSM technology. (Telewings History, 2014) Originally the company Unitech Wireless was a subsidiary of Unitech Group holding a wireless services license for all 22 Indian telecom circles since 2008. In early 2009 Unitech group and Telenor group agreed to enter a joint venture. On 2 February 2012 the Supreme Court of India cancelled 122 licenses of 22 mobile operators including Uninor. The Supreme Court directed the Government of India to conduct fresh auctions for sale of the spectrum within a period of four months. In July 2012 awaiting fresh telecom auctions after the Supreme Court cancellation of licenses Uninor decided to gradually scale down operations in 4 circles - Karnataka, Kerala, Orissa and Tamil Nadu to strengthen the focus on the top performing circles. In the 2012 auction, Uninor won back licenses and spectrum in 6 circles - Uttar Pradesh (East), Uttar Pradesh (West), Bihar, Gujarat, Maharashtra and Goa and Andhra Pradesh. The Supreme Court on 15 February 2013 ordered companies that did not win spectrum in the November 2012 auction to immediately discontinue operations hence Uninor shut down services in Kolkata, Mumbai and West Bengal after midnight on 16 February 2013. With subscriber base of over 47 million in July 2015 Uninor is India’s 8th largest mobile operator.

ix. Sistema Shyam TeleServices Limited

Sistema Shyam TeleServices Limited (SSTL), also known as Mobile Tele Systems and commonly referred as MTS is the Indian subdivision of Russian Mobile Tele Systems headquartered in New Delhi, India. It provides wireless voice, broadband Internet, messaging and data services in India. MTS India operates across India with over 8.68 million customers as on July 2015. (Sistema Shyam History, 2014)
x. **Videocon Telecom**

Videocon Telecom formerly Videocon Mobile Services is an Indian cellular service provider that offers GSM mobile services in India. The company is a subsidiary of Videocon Industries and is headquartered at Gurgaon, Haryana. At its peak, Videocon held licenses to provide mobile services in 18 out of 22 telecom circles of India. However, Videocon launched commercial services only in 11 out of the 18 circles it held licenses in. Following the 2G spectrum scam the Supreme Court cancelled 122 licenses issued by the Indian Government in 2008 including 21 licenses belonging to Videocon. In the 2012 spectrum auction Videocon won back licenses in 6 circles. In July 2015, Videocon Telecom subscriber base was that of 7.72 million. (Videocon Telecom History, 2014)

xi. **Mahanagar Telephone Nigam Limited**

Mahanagar Telephone Nigam Limited (MTNL) is a state-owned telecommunications service provider in the metro cities of Mumbai and New Delhi in India and in the island nation of Mauritius in Africa. The company had a monopoly in Mumbai and New Delhi until 1992 when the telecom sector was opened to other service providers. "Transparency makes us different" is the motto of the company. The Government of India currently holds 100 per cent stake in the company. In recent years MTNL has been losing revenue and market share heavily due to immense competition in the Indian telecom sector. In July 2015, MTNL subscriber base was that of 7.10 million. (Mahanagar Telephone Nigam History, 2014)

xii. **Quadrant Televentures Ltd**

Quadrant Televentures Ltd formerly known as The Investment Trust of India (ITI) and HFCL Infotel Ltd (2002-03) was incorporated on 2 Aug.'46. Organisation is managed by chairman and managing director B K Kothari. ITI and HFCL, a telecommunication company operating in the Punjab circle merged through a scheme of consolidation with effect from 1st September 2002. During 2003-04 the company launched its prepaid mobile product and a complete range of innovative
value added services and data products were launched in May 2004 by the introduction of DSL high speed internet product. The company became the first service provider to have launched DSL services in the state of Punjab and Chandigarh. During 2004-05 company expanded its services to 125 cities/towns with 2.47 lacs subscribers in Punjab. A wholly owned subsidiary Connect Broadband Services Limited was formed on July 2004 for the above purpose. Company offers services like fixed line Telephony, mobile telephony, broadband internet access and data networking access under the brand name CONNECT. (Quadrant Televentures Limited, 2014)

xiii. Loop Mobile

Loop Mobile usually referred to as LOOP and formerly known as BPL Mobile was an Indian mobile network operator. On 18 February 2014 Bharti Airtel announced that it had agreed to acquire Loop Mobile for 700 crore (US$120 million). At its peak Loop offered both prepaid and post-paid GSM cellular phone coverage in Assam, Kolkata, North East, Mumbai, Madhya Pradesh, Haryana, Orissa, Punjab, Rajasthan after receiving a license to operate across 21 telecom circles from the Department of Telecommunications (DoT). In May 2014 Loop Mobile’s subscriber base was that of 2.84 million which got merged in Bharti Airtel. (Loop Mobile History, 2014)

b. Equipment Vendors

According to research agency Ovum Indian telecom sector will constitute 6.6 per cent of the global demand for telecom equipment in 2014-15. (Gupta, 2014) The industry expects that it will spend Rupees 467 billion on buying telecom equipment excluding mobile phones. The major portion of this money will be spent on buying imported equipment mainly from Europe and China. According to the Telecom Systems Design and Manufacturing Association (TSDMA), Indian firms that design and manufacture and also have intellectual property had only three per cent share of the Rupees 50,000-crore telecom equipment market in 2012-13. Adding Indian made products from foreign companies that have factories in India raises the share to 10-12 per cent. Moreover, work in India is limited to assembly, integration and
packaging. The revenue for design, electronics component and the intellectual property which are major portion of this value in telecom gear goes back to exporting country in the form of foreign exchange. Manufacturing telecom equipment in India is comparatively costlier because of grant available to global companies in their own country in the form of financial loans, lesser infrastructure cost, less power costs as well as safeguarding available to them through WTO in the form of zero per cent custom duty. However, in the recent budget of 2014 government of India increased custom duty on core telecom equipment to promote Indian manufacturing.

Studies from Telecom regulatory authority of India (TRAI) in 2010 and 2011 came out with clear fact that indigenisation of telecom equipment received the least priority and generous import policy having low or no import duty did not put any cost pressures on service providers to push for manufacturing products in India. Lack of capacity building for indigenous design and manufacturing of equipment carries a grave threat to country’s future success in the sector. (Telecom Regulatory Authority of India, 2010) (Telecom Regulatory Authority of India, 2011) Studies concluded that equipment manufacturing can perform an essential part in further growth of the Indian telecom sector and therefore, indigenous manufacturing must be encouraged. Apart from economic reasons, the security considerations also suggest that India should aim achieving self-sufficiency in telecom equipment.

![Figure 3-7 Projected Demand for Telecom Equipment, 2014-20](Gupta, 2014)
In 2013, domestic manufacturing base was very low and therefore dependence on import was too high, to the tune of 87 - 88 per cent of total demand. Further study from Chattopadhyay in 2013 brought forward that domestic producers face (and will keep on facing) relentless competition from China, the global leader in production and export of telecom equipment. (Chattopadhyay, 2013) However, situation didn’t change much and imports grew regularly to US$ 12 billion in 2014-15 against exports of US$ three billion resulting in net foreign exchange outflow US$ nine billion hence impacting GDP negatively also. (Press Trust of India, 2015) (Ministry of Communications and Information Technology, 2015) Import scenario remained high because stakeholders’ business cases did not put much stress on Indian products as concentration was more on raising number of subscribers and operating margins. In order to cater to new network requirements owing to technology upgradation, or due to expansion of existing subscriber base, (Figure 3-7) demand for network equipment is increasing year on year basis with year 2015 demand of approximately US$ eight billion projected to be US$ 14 billion by year 2020, an increase of approximately 74 per cent. (Gupta, 2014) With the kind of growth the sector is witnessing, where in most of the growth targets were achieved quite early in comparison to targets, there is all likelihood that this projected increase in demand may be achieved earlier than year of 2020.

Against huge demand of telecom equipment there is very little amount of hardware which are Indian products that means the products which are designed and manufactured in India and hence having intellectual property rights with in the country. Even after consideration of products which are made in India from foreign companies then also share of value addition is very minuscule. (Figure 3-8) Situation can be recovered only if steps are initiated to boost local design and production. That would involve review of end to end cycle of manufacturing these equipment and taking necessary steps to promote manufacturing of Indian products which can be optimization of duty structure over period of time to discourage imports, discounting license fees from network operator whosoever buy Indian products, and providing funds for research. Though government expects that by 2019-20 only 20 per cent of telecom equipment in the country should be imported but considering present manufacturing scenario in the sector it looks difficult. (Gupta, 2014)
The telecom equipment business is controlled by five companies - Huawei, ZTE, Ericsson, Nokia Siemens, and Alcatel. Most of these companies have managed services contracts as well with network operators where they design and maintain networks for telecom service providers on end to end basis. These companies get support from their governments. On the other hand telecom operators because of their business cases do not insist on Indian products due to price issue and non-availability of such product which is designed and developed in India and can replace quality of foreign made products. They may be correct in their stand point because they are busy in fighting a bitter battle for subscribers and operating margins.

Situation can be recovered only if government initiates steps to boost local production. That would involve review of end to end cycle of manufacturing scenario in telecom sector and taking necessary steps to promote manufacturing of Indian products which can be optimization of duty structure over period of time to discourage imports, discounting license fees from network operator whosoever buy Indian products, providing funds for research. Some say India should learn from China which asked foreign companies to transfer intellectual property if they wanted to sell equipment but it is understood that this can be challenged by European stake

Figure 3-8 Indian Manufacturing Share in Telecom Equipment Market, 2007-13
(Gupta, 2014)
holders. Following are major telecom equipment manufacturers who are contributing to development of telecom sector in India:

i. **Ericsson India Private Limited**

   Ericsson a 19th century company is a world leader in the rapidly-changing environment of communications technology providing telecom equipment, telecom software and services to mobile and fixed network operators all over the globe. Its head office is in Stockholm, Sweden but have offices across the globe. (Ericsson: Facts and Figures, 2014) Approximately 40 per cent of global mobile traffic runs through the equipment which is supplied by Ericsson. Other than equipment supply Ericsson operates and manages networks. Ericsson manages network that cater to approximately one billion subscribers globally every day. With more than 35,000 granted patents Ericsson has one of the industry’s strongest patent portfolios. Net sales turnover in year 2013 was USD 34.9 billion with operating margin of USD 2.73 billion. In India Ericsson operates under two units from its Gurgaon location having sub offices in almost all telecom circles. Ericsson India Pvt Ltd (EIL) caters to equipment supply and services to almost all Indian operators. Ericsson Global India provides services to worldwide customers and operates from SEZ location. Ericsson India Pvt Ltd have equipment supply contract from all major operators and supply equipment like radio base stations, soft switches, media gate ways, microwave radios from its manufacturing location in Jaipur. Company also provides design, project installation and operations services to almost all major operators. Company has managed services contract with major service providers such as Bharti Airtel Limited, Reliance telecom, Telewings Communications, Aircel, and Idea cellular.

ii. **Nokia Networks**

   Nokia Solutions and Networks (NSN) formerly as Nokia Siemens Networks is a multinational data networking and telecom Equipment Company headquartered in Espoo, Finland. Company is wholly owned subsidiary of Nokia Corporation. It was a joint venture between Nokia of Finland and Siemens of Germany known as Nokia Siemens Networks. (Nokia Solution and Networks History, 2014) Nokia Networks
has operations in around 150 countries. In 2013 Nokia acquired 100 per cent of the company with a buy-out of Siemens AG. In 2015, Nokia solution and Networks announced acquisition of M/S Alcatel-Lucent and this acquisition process to start in last quarter of 2015 and expected to get concluded in beginning of year 2016. In India Nokia Networks operates from its Gurgaon office and Chennai based manufacturing location. Company also provides design, project installation and operations services to Indian operators including managed services contract with Bharti Airtel Limited.

iii. Huawei Technologies Co. Ltd.

Huawei Technologies Co. Ltd. is a Chinese multinational networking and telecom equipment and services company headquartered in Shenzhen, Guangdong. It is the one of the largest telecommunications equipment maker in the world. Huawei was founded in 1987 by ex-military officer, Ren Zhengfei and formed as a private company owned by its employees. (Huawei Technologies, History, 2014) Company’s core areas of business are building telecommunications networks, providing operational and consulting services and equipment to enterprises within and outside of China. Huawei also manufactures communications devices for the consumer market. Its products and services have been deployed in more than 140 countries and it currently serves 45 of the world's 50 largest telecoms operators. In India, Huawei had picked up market share in the last five years especially on 3G and 4G technologies and have got major 3G and 4G build up contracts from Indian operators.

iv. ZTE Corporation

ZTE Corporation formerly Zhongxing Telecommunication Equipment Corporation is a Chinese multinational telecom equipment and systems company headquartered in Shenzhen, China. ZTE's core products are wireless, exchange, access, optical transmission, data telecommunications gear, mobile phones and telecommunications software. It also offers products that provide value-added services such as video on demand and streaming media. ZTE is one of the top five
largest smart phone manufacturers in its home market and in the top ten worldwide. (ZTE Corporation, History, 2014)

v. Alcatel-Lucent India

Alcatel-Lucent is a French global telecom equipment company headquartered in Boulogne-Billancourt, France. The company focuses on fixed, mobile, and converged networking hardware, IP technologies, software, and services. Alcatel-Lucent has operations in more than 130 countries. Alcatel-Lucent is under the leadership of chief executive officer Michel Combes and the non-executive chairman of the board is Philippe Camus. After seven consecutive years of negative cash flows, in October 2013 the company announced plans to slash 10,000 employees, or 14 per cent of the total current 72,000 workforce, as a part of a €1 billion cost reduction effort. In India also Alcatel-Lucent is losing market share regularly. In 2015 company is going to be acquired by M/S Nokia Solutions and networks. (Alcatel-Lucent History, 2014)

c. Infrastructure Providers

The skylines of Indian cities and villages have transformed over the past 10 years due to cropping up of telecom towers which mostly are on top of the tallest buildings. These towers provide network coverage to one billion subscribers and present count of towers stands around 500,000+ covering more than 90 per cent of the country’s land area. Most of these towers fabricated from of iron angle bars with GSM antennas (Rectangular), radio unit and microwave antennas (mostly round) mounted on them which are connected with cables to a small shed at the base which houses radio frequency and transmission electronics. A mobile tower connects two callers to each other via switching centres giving them access to mobile communication. Tower industry has been separated from the telecom services sector to get this a status of infra-structure industry and to initiate cost optimization in telecom companies which are fighting for margins due to competitions on mobile tariffs. Keeping tower companies separate give added benefits to telecom operators such as optimized capital investment, faster time to market, operational efficiencies, and revenue maximization. Tower Company’s business model of infrastructure sharing
is based on building, owning, operating and maintaining the passive telecom infrastructure sites which can accommodate multiple service providers. The savings in budgets due to sharing of infrastructure can be used to other core fields which shall yield higher margins. Maintaining these towers poses a tough challenge for the tower players due to multiple factors like fuel consumption for power generation, strict guidelines of radiations, power usage, and theft of equipment from site, landlord and owner issues, terrorist activities, guidelines on green telecom, clearance from municipal, government, community and environmental bodies. Following are major tower service providers who are contributing to development of telecom sector in India:

i. **Indus Towers**

   Indus Towers is a joint venture between Bharti Airtel, Vodafone India and Idea Cellular in which India's top two network operators have 42 per cent share each while Idea holds 16 per cent. India's tower industry has gone through tough time post 2012 when due to cancellation of 122 licenses by Supreme Court network affected operators scaled down their network growth plan and brought it to almost negligible but Indus Towers could overcome that challenging situation and installed 2,000 towers and 18,000 tenancies on average each year because most of customer were established operators. Indus builds, operates and manages tower base in 15 of the country's 22 circles on which carriers set up radio base stations or microwave equipment for voice and data coverage. Indus owns approximately 110K+ towers across country. (Indus Towers History, 2014)

ii. **Bharti Infratel Limited**

   Bharti Infratel is a provider of tower and related infrastructure and is one of the largest tower infrastructure providers in India based on the number of towers. Bharti Infratel owns over 45,000+ Towers across 18 states and 11 telecom circles. Bharti Infratel also has 42 per cent equity in Indus Towers and they are the one who pioneered the tower infrastructure sharing concept in India. Almost all major operators are hiring and taking tower services from Bharti Infratel. (Bharti Infratel Limited, 2014)
iii. Reliance Infratel Limited

Reliance Infratel Limited (RITL) a subsidiary of Reliance Communications Limited. Company was incorporated in 2001 as a private limited company. RITL’s wireless towers portfolio comprised of approximately 48,000 towers and has a presence in all 23 telecom circles in the country making it one of the largest pan-India tower players. RITL’s tower portfolio is uniformly distributed with approximately equal number of towers in all the 4 regions. (Reliance Communication, 2014)

iv. Viom Networks

Viom Networks is a Tata Teleservices and SREI Infrastructure joint venture. The Company has relationships with most of telecom operators in India like Tata Teleservices, Bharti Airtel, Aircel, MTS, Vodafone, Idea, Uninor and BSNL. The company has 92,000 tenancies on over 42,000 towers spread across India with the highest tenancy ratio of about 2.2. (Viom Networks, 2014)

v. GTL Infrastructure Limited

GTL Infrastructure Limited is in the business of shared passive telecom infrastructure in India. The company has a portfolio of over 30,000 towers located across country. GTL Infra has a portfolio of towers serving all the major cellular operators. (GTL Infra, 2014)

Other than these, 5 main tower companies who own approx. 300K towers, players like Essar Telecom, American Tower Corp, Tower Vision, Aster Infrastructure, India Telecom Infra Limited, KEC International, Independent Mobile Infrastructure put together own approx. 15000 towers. In addition, state owned companies BSNL and MTNL build and maintain their own towers and their current count is approximately 95000+ towers.

3.4 REGULATORY FRAMEWORK

Indian telecom sector has developed a long way in the last 20 years and this development has been possible because of reforms and liberalization in Indian economy
and regulations. The regulatory and policy changes of the government has played a key role in this extraordinary progression during the last 15 years. The key regulatory bodies of the telecom industry operates under ministry of communications and details for these are as follows (Figure 3-9):

a. **Department of Telecom (DOT)**

The Department of Telecom comes under the purview of Ministry of Communications and Information Technology. It formulates developmental policies for the accelerated growth of the telecommunication services. The department is responsible for granting licenses for various telecom services like Unified Access Service, Internet and VSAT services, managing radio frequency in close coordination with the international bodies and enforcing wireless regulatory measures by monitoring wireless transmission of all users in the country. DoT has got five major divisions to carry out these tasks.

i. **Wireless Planning Coordination Wing (WPC)**

The WPC Wing of the Ministry of Communications created in 1952 is the national radio regulatory authority responsible for frequency spectrum management, including licensing and caters for the needs of all wireless users in the country. It exercises the statutory functions of the central government and issues licenses to establish maintain and operate wireless stations. WPC is divided into major sections like licensing and regulation, new technology group and standing advisory committee on radio frequency allocation (SACFA). SACFA makes the recommendations on major frequency allocation issues, formulation of the frequency allocation plan, making recommendations on the various issues related to International Telecom Union (ITU) sorting out problems referred to the committee by various wireless users, issues clearance to all wireless installations in the country.
Figure 3-9 Exclusive Regulatory Structure for Telecom Sector
ii. Telecom Engineering Centre (TEC)

TEC is a technical body representing the interest of Department of Telecom responsible for formulating specification of common standards with regards to telecom network equipment, services and interoperability, issuing interface approvals and providing technical support to DOT, TRAI and TDSAT.

iii. C-DoT

Centre for development of Telematics (C-DoT) is a research and development unit under the Department of Telecom.

iv. Public Sector Undertakings

The DoT has the public sector undertakings under its fold which are Bharat Sanchar Nigam Limited (BSNL), Mahanagar Telephone Nigam Limited (MTNL), Indian Telephone Industries (ITI) and Telecommunications Consultants India Limited (TCIL).

v. TERM cell (VTM)

In 2004 The Department of Telecom created 4 vigilance telecom monitoring cells (VTM) to monitor and control illegal and clandestine telecom operations in the country. Later on the VTM cells were increased to 34 and the scope increased to other activities like analysis of call and subscription data, monitoring of network parameters, customer document verification and grievance redressal of the subscribers. These VTM cells were later rechristened as Telecom Enforcement Resource and Monitoring Cells (TERM) in 2008.

b. Telecom Commission

The Telecom Commission was set up by the government of India in 1989 with administrative and financial powers of the Government of India to deal with various aspects of telecommunications. The Telecom Commission is responsible for policy formulation, licensing, wireless spectrum management, administrative monitoring of PSUs, research and development and standardization.
c. **Telecom Regulatory Authority of India (TRAI)**

TRAI was set up in 1997 by the government of India as an independent regulator of the business of telecommunications in the country. TRAI is mandated to provide an effective regulatory framework and adequate safeguards to ensure fair competition and protection of consumer interests. The mission of TRAI is to create and nurture such conditions that encourage the growth of the telecommunications sector in India so that the country can play an important role in the world of telecommunications society. The main objective of TRAI is to form a transparent and fair policy environment that encourages fair competition. TRAI’s powers and functions include settlement of disputes that arise between service providers, maintaining a register of interconnect agreements, and give advice to the government at the centre on subjects that are connected with the development of the telecommunication technology. TRAI issues large number of directives, regulations, and orders that deal with various subjects such as interconnection, service quality, and tariff.

d. **Telecom Disputes settlement and Appellate Tribunal (TDSAT)**

TDSAT was set up in May 2000 by the government of India to adjudicate over disputes that arise in the telecommunication sector. TDSAT was established with the view to protect the interest of the consumers and service providers of the telecommunication sector and also to encourage and ensure the growth of the telecommunication sector. The chairperson of TDSAT is appointed from the ranks of chief justice of a High Court or a Supreme Court judge and holds office for a period of 3 years. The TDSAT can adjudicate any disputes that arise between a group of consumers and service providers, a licensee and a licensor and also between two or more service providers. The power and function of tribunal includes that it can hear the appeal and also dispose appeals that are against any order, direction or decision of the TRAI.

e. **Non-Regulatory Bodies**

All the private industry players such as network providers, equipment manufacturers and tower companies are associated with each other in the following non-regulatory
bodies to make their voices heard at the time of policy making and to have collaboration among players:

i. **Cellular Operators Association of India (COAI)**

The COAI was set up in 1995 as a registered non-governmental and non-profit society. COAI is the official voice for the cellular industry in India and it interacts on its behalf with the licensor, the telecom industry associations, the management spectrum agency and the policy makers. The core members are Aircel, Airtel, Idea, Vodafone, Videocon, Loop and Spice. The tower telecom companies and telecom equipment manufacturers are also part of this association.

ii. **Association of Unified Telecom Service Providers of India (AUSPI)**

AUSPI is the representative industry body of Unified Access Service Licensees providing telecom services in the country with CDMA and GSM technology, fixed line services and value added services. The Association interacts on policy and regulatory issues with various government bodies and other apex industry organizations on behalf of its members. The association formulates expert opinion on industry issues and submits recommendations to the concerned authorities. The members of AUSPI are Reliance Communications, HFCL, Tata Tele and Sistema Shyam Telecom.

### 3.5 EQUIPMENT MANUFACTURING SCENARIO

Telecommunication equipment can be categorised based on their usage as the ones required by telecom network operators to build the network in order to provide services to end users or equipment used by ultimate users for utilising services being offered by telecom service providers such as mobile handsets, dongles, modems, and data cards as exhibited in Table 3-3. Network equipment to build telecom network can further be classified based on their transmission or radiation capabilities as active equipment such as circuit switches (MSC), base station controller (BSC) radio base stations (RBS), intelligent network (IN) charging solutions, routers, local area network (LAN) switches and transmission equipment such as microwaves or as passive equipment to house or mount active equipment such as shelters, environmentally tested cabinets, fabricated
towers, electrical, or optical cables and cable ducts. Country is able to achieve indigenisation in passive equipment but indigenisation content is very minimal in active network equipment or in end user equipment and throughout this paper focus is given to active telecom network equipment as large part of capital expenditure is spent by network service providers in this category of equipment.

Wireless network equipment, based on their technological platforms is labelled as second generation (2G), third generation (3G) or fourth generation (4G or LTE) equipment. Present mobile network of country is spread with 2G and 3G’s equipment and from second quarter of calendar year 2015, 4G equipment demand is also picking up due to increase in data demand. Technically most of this equipment is subdivided into radio access network (RAN) equipment through which end user gets engaged into telecom network at first instance, radio network controller equipment which connects RAN equipment to circuit switching equipment, switching equipment, and other core equipment. The present wireless market is estimated to be around US$ seven billion. Most of the content of this segment is coming from overseas either in the form of 100 per cent imported goods or in the form of Indian manufactured good where most of the raw material for the same is getting imported and even intellectual property rights (IPR) also resides outside the country.

Fixed wire line connections are on down trend and not much investment is expected from operators in this technological segment. It is estimated that capital expenditure in this segment is expected to remain less than US$ one billion which is very minuscule in comparison to wireless equipment hence, not much concentration is given on this segment during this study. The internet protocol (IP) and the packet switching equipment are generally equipped in the networks for building up the backbone and aggregation. Main category of the equipment covered in these are local area network (LAN) switches, routers, soft switches, media gateways, signalling gateways and session border controller. It is estimated that capital expenditure in this segment is expected to be around US$ one billion because of modernisation requirement of aging equipment. Country has dependency in this segment also on overseas manufacturers.
Transmission equipment builds paths between supplementary constituents of the network. This transmission equipment can be on microwave link, optical fibre or on copper link and this equipment is used to carry traffic between sites to a central point. In the majority of cases data is backhauled from RAN equipment in a mobile network to the RAN Controller through wireless microwave networks and further, fibre optic network carries traffic to backhaul in the core network. It is estimated that capital expenditure in this segment is expected to be around US$ one billion. These are again high technical product where design capability still does not exist within the country.
and most of the nodes are imported from European nations or being manufactured here with intellectual property rights residing outside India.

![Figure 3-10 Category wise Value Share Estimate of Telecom Equipment](image)

**Figure 3-10 Category wise Value Share Estimate of Telecom Equipment**

Wireless equipment and end user equipment are top two categories where the maximum spend is expected to be there in the sector (Figure 3-10). IP and packet switching and transmission equipment are comparatively expected to be incurring less of spend but these category of products carries maximum amount of security risks and hence buying these from the overseas technology may carry a risk to the telecom network of the country.

![Figure 3-11 Global Subscriptions by Technology](image)

**Figure 3-11 Global Subscriptions by Technology**

(GSMA Intelligence, 2014)
Challenge in this sector is that it is so much dynamic that technology keeps on changing very fast and by the time one technology stabilise, another category of technology will be evolving farther away. Expected global forecast (Figure 3-11) on technology fronts is that 2G technology though in downward trend but going to remain in appreciable presence till 2020. Upward trend is likely to continue for 3G technology and technology expected to be at its peak during 2019-20. 4G technology which debuted in year 2014-15 is the one which is expected to drive the growth in terms of additional equipment demand for the sector.

End user equipment is that equipment which is in possession of subscribers and through which they avail services of telecom network. This end user equipment can be mobile handset devices like mobile phones and smart phones, data cards, dongles, modems and routers, adapters, IP-phones that allow users to use signals from the telecom networks in voice, video or data formats. The world-wide handset demand in year 2010 was about 1.2 billion units worth US$ 150 billion and according to international research firm Strategy Analytics, global smart phone sales are forecasted to grow from 1.5 billion units in 2015 to a record 1.7 billion by 2017. By the growing trend of smart phones in India, country is expected to surpass USA in smart phone market and will become second largest market by 2017.

At present China, India and USA are the three big markets driving smart phone growth worldwide. India is likely to clock sale of 118 million smart phones in year 2015 and USA likely to sell 164 million smart phones in 2015 with expected growth to 169 million in 2017. On the other hand China will maintain its dominance with 458 million in 2015 and with expected growth to 505 million in 2017. (ETTelecom.com, 2015) The handset market was estimated to be US$ 4.5 billion by 2014 and likely to cross US$ 5.5 billion in 2015 as exhibited in Figure 3-12 and country is expected to be among top two markets of smart phones but still country is heavily dependent on imports and is not able to mint money properly for economy from such a huge market.
According to the Telecom Systems Design and Manufacturing Association (TSDMA), there were only 3 per cent Indian products in 2012-13 (Figure 3-8) which means that products those were designed and manufactured in India and hence having intellectual property rights within country. After considering the value addition from products made in India from foreign companies also this share increased slightly to 10-12 per cent. For Indian manufactured products, value addition in country is restricted to only final assembly, integration and packaging. For these Indian manufactured products the foreign exchange outflow from the country takes place in the form of design charges, import of electronics components and sub-assemblies, share of profit to offshore principal owner and, cost of the intellectual property. Hence, major portion of this value in telecom gear goes back to exporting or parent country.

Manufacturing telecom equipment in India is comparatively costlier because of grants available to global companies in their own country in the form of financial loans, lesser infrastructure cost, less power costs as well as safeguarding available to them through WTO in form of zero per cent custom duty. However, in recent budget in 2014 government of India increased custom duty on core telecom equipment to promote Indian manufacturing. There have been some increase in Indian manufactured products
in the last 3-4 years but there is no appreciable increase in Indian product. In order to understand the contribution to economy from Indian manufactured products there is a need to understand the value addition coming through these during the process of manufacturing of products. Value addition to Indian economy from these Indian manufactured products come from material which has got origin in the country itself and cost of intellectual property rights which are not required to be paid outside country.

Table 3-4 Value Share Approximation for Indian Manufactured Products

<table>
<thead>
<tr>
<th>Cost Origin</th>
<th>Material Cost of Imports</th>
<th>Material cost in Country</th>
<th>Design Charges</th>
<th>Software</th>
<th>Foreign Expatiate cost</th>
<th>Salary to Indian Staff</th>
<th>Taxes with in country after offsetting input credits</th>
<th>Profit to Principal owner</th>
<th>IPR Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overseas Cost</td>
<td>40</td>
<td>5</td>
<td>20</td>
<td>5</td>
<td>7.5</td>
<td>2.5</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost With in Country</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

Note: Approximation was obtained through discussions with multiple respondents in the sector. As most of these data is confidential for companies involved, exact value share is difficult to determine with present set of structure.

An approximation of breakup of value share is shown in the illustration in Table 3-4, as per this approximately 80 per cent value share of these Indian manufactured products goes out of shores of the country. In order to review the present scenario of manufacturing of telecom equipment, data was reviewed from multiple sources such as Telecom Export Promotion Council, Director General of Foreign Trade, DGCIS and Industry estimates, however, there is difference in data from multiple sources and at present there is no single organisation which keeps track of manufacturing database of telecom equipment production in India and compares the value addition this manufacturing brings to Indian economy. In financial year 2009-10, Indian demand for telecom equipment was US$ 9.13 billion and production figures for the same year was approximately US$ 8.50 million. After reviewing the demand and production figures, the domestic production appears to be meeting a large part of the Indian demand but that is not the real scenario because same year imports were of US$ 8.06 million that is 88 per cent of total demand hence, there was a small value addition for local use or for
re-exports. The average value addition in 2011 was of the order of 12 per cent only. Moreover, out of these 12 per cent only 2.6 per cent was attributed from Indian products. (Telecom Regulatory Authority of India, 2011)

![Figure 3-13 Telecom Imports in India, 2007-15](image)

*Figure 3-13 Telecom Imports in India, 2007-15*

(Telecom Regulatory Authority of India, 2011) (Department of Telecommunications, Ministry of Communications and Information Technology, 2015)

Telecom imports grew by over 20 per cent to US$ 12.4 billion in financial year 2013-14. *(Figure 3-13)* In year 2011-12 these imports were worth US$ 9.9 billion which went up to US$ 10.3 billion in 2012-13. In financial year 2014-15, imports were at US$ 11.6 billion. Similar increase trend was seen in mobile handsets as well where numbers went up to 225 million handsets in 2014 from 187.5 million in 2013. Though the demand is on upward trend but the manufacturing capacity of these devices made in India had shown a reducing trend from 155 million in 2011 to 58 million in 2014. India's imports of telecom equipment in financial year 2014-15 was US$ 11.6 billion against exports of 3.4 US$ billion, resulting in a net foreign exchange outflow of US$ 8.2 billion. Telecom sector is booming and expected to remain growing at strong pace with tele-density of more than 75 per cent but manufacturing of telecom equipment is on downward trend (Sharma, 2015).
However, due to efforts of successive governments there is an increase in export of Indian manufactured goods and some passive Indian products like cables. Export of this equipment other than mobile phones slightly increased from US$ one billion in 2011-12 to US$ 1.2 billion in 2013-14. (Figure 3-14) (Department of Telecommunications, Ministry of Communications and Information Technology, India, 2015) On the other hand, mobile phones had shown decreasing trends in last three years due to delayed availability of upcoming technologies and shut down of mobile units such as of Nokia.

Table 3-5 Share of India in World exports for Telecommunication and sound recording and reproducing apparatus and equipment (Government of India, 2015)
Though country is expected to be number two market of telecommunication sector in terms of consumption and has recently touched one billion connections in 2015 but domestic manufacturing scenario is grim. Figures of exports of telecom equipment from India as percentage of global exports reveal that (Table 3-5) export numbers from India are less than one per cent of global exports.

![Figure 3-15 Comparative Trends for Foreign Direct Investment, Imports, and Exports of Telecom Equipment (Including Mobile Phones)](http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=12452)

**Figure 3-15 Comparative Trends for Foreign Direct Investment, Imports, and Exports of Telecom Equipment (Including Mobile Phones)**

(Telecom Regulatory Authority of India, 2015)


On reviewing comparative trends for foreign direct investment, imports and exports of telecom equipment including that of mobile phones, (Figure 3-15) it is clearly visible that though stake holders may boast of telecom sector bringing foreign direct investment to country but negative trade balance of import and export is much bigger than that of this investment. This results in huge outflow of foreign exchange from country. That means countries or overseas institutions are investing in sector utilising the market and getting much higher returns in terms of revenue to their
countries from import bill of India. If one adds outflow of foreign exchange of royalty fees, service charges, and patent fees this trade balance will be further skewed towards negativity for country. There should not be any second thought to turn around the situation, wherein a concentrated effort is needed to be put in place which should be synchronised with all the stake holders involved.

3.6 MAJOR GOVERNING FACTORS IN TELECOM SECTOR

Following are major governing factors which are impacting the sector in India and expectation is that these factors will keep on formulating the guidelines or ways of working in Indian telecom sector. All these factors have their own prospects and challenges to overcome for all stake holders in the telecom sector i.e. network operators, equipment manufacturers, application suppliers, service sources, regulatory organisations and content developers. In order to ensure the sustainable growth of the sector it is must that all these stake holders take cognizance of these governing factors so that they are better updated and take quick and correct decisions. Governing factors are listed as follows:

a. Web Conjunction

Web conjunction had been one of the major guiding factors in telecom world over in last few years and same trend is visible in India as well as depicted in below two figures. More and more reliance on web based activities shall require extensive coverage of telecom network with high data handling capability, economically viable applications, devices and tariffs. To meet the ever growing requirement of internet the basic infrastructure in both wire line and wireless telecom sector has to grow and this seems to be the biggest challenge for network and service providers who need to keep pace with the rapidly increasing data demand. With more and more demand coming in from data network providers and government had to move towards data oriented technologies like 3G, LTE, and WiMAX.

For Operators there are multiple avenues for revenues from data such as monthly subscription from subscribers for accessing broadband on their handsets, revenues from an array of web-related applications including streaming music and video and social networking sites who gets revenues from advertisements and user
...data base on their portals. In additions revenues come in form of value added services such as caller ring back tones (CRBT), mobile radio, gaming, and mobile television (TV) offered by operators, interactive voice response (IVR), machine to machine (M2M) communication.

Figure 3-16 Indian Broadband scenario, July 2015
(Telecom Regulatory Authority of India, 2014) (Telecom Regulatory Authority of India, 2015) (Frost & Sullivan, 2012)

In order to get fruits of this opportunity of data growth operators have to work on to improve quality of service, maintain speed of connection and provide easy billing plans which can be understood by all type of consumers. Operators have to focus on increasing the overall service performance by deploying quality network infrastructure. Also operators have to shift focus from urban to rural areas which is an untapped area and where broadband connectivity is almost negligible. Operators have to collaborate with application providers to provide application which clicks in
these rural areas and give them the cutting edge. Post 2G scam the growth and investments made in the telecom industry have come to a standstill. Few of foreign stakeholders have already exited the business and most of network providers have adopted the wait-and-watch mode putting a go slow on their capital expenditure. The new government has to focus on eradicating confusions in the sector and re-affirm all stakeholders. Stake holders need to be given clarity about the spectrum such as 2G spectrum re-auction, auction of lower-frequency bands such as 700 MHz, policies regarding spectrum sharing, mobile virtual network operator (MVNO) and spectrum re-farming out at the earliest.

Equipment vendors like Ericsson, Nokia and Huawei have to focus on generating Indian made economical solutions to facilitate network operators to handle the increase in data. Vendors have to constantly develop their product portfolio with available technological developments in terms of reducing power consumption, enabling infrastructure sharing, and optimizing data traffic. Similarly handset and tablet PC suppliers have to focus on offering low cost devices as well as providing the entire ecosystem such as specific content and applications, establishing a robust distribution network and a good after-sales support service. These vendors have a committed focus on unconventional sales channels such as online marketing and large format retail content. With increasing mobile broadband penetration, content and application providers now have a direct connect to the end users. They are focusing not only on providing sticky content and innovative applications but also ensure that the diverse end users can easily access these services.

b. **Rise of New Generation Telecom Devices**

New generation of mobile telecom devices including smart phones, tablet PCs and e-readers have reinforced the growth of data in telecom sector. In developed countries like U.S. and Japan smart phone users had already surpassed non-smart phone users and India is set to become the third-largest market for smart phones in four years. The India smart phone market grew by 229 per cent year over year (YoY) in the third quarter of 2013. (International Data Corporation, 2014) According to International Data Corporation's (IDC) quarterly Mobile Phone Tracker mobile
phone vendors shipped a total of 12.8 million smart phones in Q3, 13 compared to 3.8 million units in the same period of 2012. Q3, 13 grew by close to 28 per cent over the units shipped in the second quarter of 2013.

Figure 3-17 Smart Phone Market
(International Data Corporation, 2014)

With phone makers launching more affordable 3G handsets to tap buyers in small cities and towns smart phone shipments to India are forecasted to increase to 155.6 million units in 2017 accounting for a 10.3 per cent share of the global market behind China’s projected 30.2 per cent share and the US’s 12.1 per cent. (Mint Live, 2013) In March 2012, India ranked sixth with a global market share of 3 per cent; China had a 32.8 per cent share and the US 15 per cent. Smartphone consumption in India is poised to develop because of multiple factors such as accessibility of economical devices, stress on less populous regions, expansion of 3G and 4G networks. Considering above factors growth of smart phone shipment is projected to be one of the highest among the top countries—China, US, UK, Japan, India and
Brazil. Further, sale of smart phones is going to be further spurred up because prices of smart phone had dropped below $75 (about Rs.4,000). As share of Indian players like Karbonn Mobiles, Micromax is growing and existing players like Nokia, Blackberry, Apple, and Samsung coming out with the aggressive product and marketing techniques to maintain their bases prices are heading downwards.

Among operating systems, Android is dominating the Indian smart phone market due to higher sale of Samsung and the growth of Indian handset makers. Microsoft Corp.’s Windows operating system in Nokia Lumia series is now picking up and product range is available from mid end to higher end series. With increased focus from Apple it had concentrated on augmented distribution, promotion budget and team amplification and this has returned in enhanced sales of iPhones. Tablets and e-readers though are in nascent stage in India but tablet shipments for year 2013 stood at 4.14 million units representing a year-on-year growth of 56.4 per cent over year 2012. (International Data Corporation, 2014) In order to cater to surging data traffic from these smart phones and other data devices like tablets, e-readers network operators had to ascertain quality network capacity and regulatory authorities had to bring clarifications on spectrum allocation policies and on new technologies.

c. Cyber Threat / Attack

A disastrous by-product of the dependence on telecom products and services is cyber threats on individuals, organisations and governments. Year 2013 saw a noticeable surge in the occurrence of cyber-attacks on Indian organisations with government and private infrastructure equally affected. Financial markets and essential services like transportation, public utilities, communication and energy transmission are now all connected to telecom network in one way or other. Arbor Networks' research report states that 2013 witnessed a huge rise in attacks against the banking and financial services sector. (Athavale, 2014) Government establishments also faced such attacks. The firm said there was a 136 per cent increase in cyber threats and attacks against government organizations and 126 per cent against financial services organizations in India. This is the shady aspect of the increasing addiction on mobile systems and smart phones.
This threat may come in form of multiple online breaches like hacking, phishing, defaced websites, network break-ins, virus attacks. Indian organisations who have recently faced such attacks are Indian Navy’s Eastern Command systems (June, 2012), officials of Ministry of External Affairs, Ministry of Home Affairs, Defence Research and Development Organisation (DRDO), and the Indo-Tibetan Border Police Force (ITBP). Even the main National Informatics Centre email server which serves as the nexus for all government departments was believed to have been affected. There are few unpublished reports being available for involvement of hackers from our neighbouring country’s getting involved for breaking into the websites of the Central Bureau of Investigation (CBI) and the Bharat Sanchar Nigam Limited (BSNL) mostly to deface the sites and leave hate mail. To make matters worse it is extensively understood that terrorist organisations are using social media sites to not only connect effectively but also to recruit novices and spread hate material all under the government’s nose.

Today telecommunication is assimilated into internet since the introduction of internet protocols on mobile devices and telecom has been identified as one of the primary factors for the increase in the number of attacks. Russian cyber security solutions firm Kaspersky Lab placed India second on its 2013 list of those countries must vulnerable to attacks on mobile phones. (Saksena, 2014) For its telecom industry India incorporates equipment and infrastructure from global telecom companies including some Chinese companies few of which have been curtailed in business in U.S. and Europe because of their history in relation to cyber threats. In order to counter these threats Telecom Regulatory Authority of India (TRAI) had come up with guide lines to set up testing lab for testing of equipment getting installed in telecommunication network but on ground this lab has yet to start operations. Moreover, both public and private sector has to facilitate set up for production of Indian products (Not only Indian made) that means products whose intellectual property rights resides with in country.
d. **Green Telecom**

Another trend which is impacting the telecom sector is the development of “green telecom” solutions. Growing telecommunications infrastructure necessitates growing quantity of electricity to keep itself running. Portion of this power originates from the grid and residual through burning of fuel like diesel. Both of these sources contribute to emission of greenhouse gases (GHG) and ultimately creating negative impact on environment. Green telecom is called reduction of these already produced greenhouse gases or reduction of causes which shall produce these greenhouse gases. Green telecom has many aspects in terms of its network, equipment, design of telecom buildings and safe telecom waste disposal. The information and communications technology (ICT) industry alone accounts for about 2 per cent or 860 million tonnes of the world’s greenhouse gas emissions. (Telecom Regulatory Authority of India, 2011)

The main contributing sectors within the ICT industry include the energy requirements of PCs and monitors (40 per cent), data centres about 23 per cent and fixed and mobile telecommunications contribute about 24 per cent of the total emissions. Compared to the other sectors such as travel and transport, construction and energy production the ICT sector is relatively energy-lean with telecommunications contributing just 0.7 per cent or about 230 million tonnes of greenhouse gas emissions. (Telecom Regulatory Authority of India, 2011) Indian telecom sector contributes minimal amount in this global carbon footprint but as environment change and sustainability are on everybody’s agenda there is an intensifying stress to push for telecom operators to use cleaner energy options like solar, wind, biomass and fuel cell technology. However, because of constraints on cost, effectiveness and capacity implementation of these technologies is tough. Similar scenario prevails in other industries. As a result in order to ensure that telecom operators adapt these technologies, government of India need to incentivize a steady and systematic movement to cleaner energy resources and telecom sector can be given credits for the carbon footprints they save in other industries by development of communication system such as amount of reduction in air travel due
to development of video conferencing facilities can be credited to telecommunication sector.

e. Social development related applications

In order to cater to the masses, applications developers are working on to develop the applications which are meant for rural sector. As numbers of smart phones reaching to rural area are increasing and if the applications are not suitable to the society who is residing in these rural or sub urban areas, then success of telecom in those areas may differ from expected results. Few of such applications are:

i. M-Education

Telecom revolution is enduring to develop its approach into the education sector bringing out new avenues for m-education. Since the approach of mobile communication is higher than any other communication media prevalent in Indian scenario now a day’s hence this practice which is in an early stage of implementation is capable to bring out results which shall yield outstanding welfare to society. Educational organizations are using low-cost mobile devices to deliver education to children in underprivileged parts and learners are able to get global knowledge and content that would have been otherwise unimaginable. In India, the “Learning with Vodafone” initiative has distributed math, science and English content via tablets for use in classrooms. In order to unleash the full potential of m-Education regulatory bodies and educational institutions have to understand its challenges. Organisations need to promote culture of m-education and applications have to be developed by application developers to handle level of diversity in the country.

ii. M-Health

M-Health is regarded as the provision of healthcare facilities or consultations with a mobile phone. This service is again in nascent stage in India and few hospitals have initiated this in urban areas but its true potential can be delivered in uplifting the society when this reaches to masses in rural sector. Level of sophistication can vary from market to market depending on its diversity such as provision of already
available knowledge about an ailment or disorder or management of complete healthcare what could be delivered by only a face-to-face interaction with a healthcare provider such as a patient in rural sector monitoring his or her heart rate on his phone and send the readings to doctor sitting in nearby cities, paying consultation fees through m-Money, getting prescription, ordering online medicines, tracking shipment of medicines and delivery of the same. A well-known example of m-health is Vodafone’s Ask a Doctor – Health@5 mobile app. (Lunde, 2013). This service allows individuals to read basic information about disease management, common healthcare myths and wellness. Users can also send questions to a panel of medical experts that are answered within 24 hours. All of these services are offered at a cost of Rupees 5 per day. M-Health is able to change the healthcare services in India by improving healthcare availability for the vast underprivileged rural area and improving patient care for urban consumers. However, rural and urban markets in India have distinct requirements.

iii. M-Money

M-Money is regarded as the provision and transfer of credit through a mobile phone. M-Money or m-Paisa or M-Wallet is an efficient option in evolving economies as the number of mobile users in these economies is more than that number of persons holding bank account or computers. Mobile devices are a persuasive way for taking financial transactions services to the underprivileged areas of the country. This can play a major role in not just semi urban and urban cities but also in rural areas as well. Multiple transactions like payment for utilities, mobile bill, transport services, medical services, ticketing, communication, paying at petrol stations and banking service can be carried out through m-Money. Because of lack of knowledge and visible high transaction fee this service is not much used in India but now it is picking up pace and helping the migrant workforce to send money back home. As a new opportunity it gives telecom operators a revenue opportunity by going into areas where individuals do not have or do not want bank accounts. It can easily be applicable in sectors. The Reserve Bank of India has started a pilot project to check feasibility of offline cash-out trial using biometric authentication. The project
allows mobile payment providers to test cash withdrawal facilities for a small portion of their semi-closed mobile wallet users.

f. Current Regulatory Scenario

Legal, tax and regulatory certainty is a non-negotiable pre-requisite in today’s investment environment. The recent judgment of the Supreme Court in the Vodafone case on taxation of cross-border transactions involving investments in India provided some much needed certainty to investors. This order may dampen investor confidence. While the SC seems to have been aggressive in penalizing entities for following existing policies, it is not to be doubted that the SC has to be commended for passing a courageous judgment upholding the need for transparency in government policies which paves the way for ensuring that all policy decisions should be reasonable and clear.

These governing factors have a substantial influence on the Indian telecom industry and shall be playing a major role in deciding the prospects of this sector. Understanding these factors by all stakeholders involved in the sector shall help in leveraging these to growth of the sector.

3.7 CHALLENGES FACED BY THE TELECOM SECTOR

As evident from present status telecom industry is going through changing time where in on one side revenue is under constraint and on another side cost is on upward side because of requirement of modernisation of network to cater to new technologies. Following are the major identified challenges which are being faced by the telecom industry:

a. Downward Trend in Subscriber Growth

Subscriber growth is already down from 24 million a month to three million subscribers per month in last two years. With rural network expansion still slow where only the growth opportunities are there and disconnections increasing due to operators getting rid of dormant accounts from their base figures, a real slowdown in overall subscriber growth is clearly visible. Though sector recovered from its worst ever phase in 2012-13 but subscribers’ growth trend is certainly going to
reduce as soon as market is going to be mature further. (Figure 3-18) The most of growth is expected only from technology change only.

![Number of subscribers in million](image)

**Figure 3-18 Subscribers Growth Trend**
(Source: Telecom Regulatory Authority of India, Multiple reports)

b. The Network Re-engineering

With spectrum becoming a costly and scarce resource, every operator had to relook into their network design so that they can leverage opportunities to deliver better quality at low cost. Also all equipment which is eight to ten years old had to be replaced for want of upgraded technology. This shall certainly require intense network planning, rollout, and innovation that means additional cost to meet challenges of Industry.

c. Ways to Maximize Return on Capital

Slow Revenue growth shall put pressure on industry to monitor and control cost but on another side everyone will like to increase revenue which will result in cost increase. Clearly that will push industry to go ahead with project with good return of capital and balance with low return of capital had to wait.
d. **Data Explosion and Service Centric Industry**

With influx of smart phones and new technologies surrounding data usage, data growth is clearly visible and expects a data explosion in next five years. Industry especially operators have to refocus their efforts on engaging customers through services and experience. New services are being launched or existing one being made cost effective to gain volumes such as mobile advertising, mobile TV, mobile Money.

e. **Tough Regulatory Environment**

With sudden growth in this evolving industry marred by multiple scams, regulator is forced to impose tough regulatory norms. Some of these, such as equipment testing are not practically implementable in present environment hence, spreading confusion in Industry. With new government in place in 2014, expect that tough regulatory environment shall prevail in next five years at least.

f. **Electronic Waste Generation**

Operators who all started their operations in 2004-05, need to renew their network because there is need to upgrade technology to milk existing network which will result into huge amount of electronic scrap getting generated. This shall certainly leave an impact on environment if not disposed properly.

Recent downsizing of most telecom companies signify continued headwinds being faced by the challenges in the Indian telecom market. Few MNCs like DoCoMo, Sistema even reduced their stakes in Indian venture. With huge investments required by operators towards renewal of network to cater to data services the consolidation process is expected to accelerate so that mounting debts in industry can be controlled. After reviewing challenges, it is quite clear that telecom industry is going through tough phase. Though industry hit the one billion subscription mark during mid 2015 but it continues to be deeply constrained by the negative growth witnessed in 2012. At the end of the calendar year 2012, the Indian telecom industry closed with revenues of Rupees 1,487 billion or US$ 27 billion, a meagre 2.3 per cent of the estimated global telecom revenues of Rupees 1.16 trillion. The industry’s total debt was up 200 per cent from Rupees 827 billion or US$14 billion in 2008-09 to Rupees 2500 billion or US$ 42
billion in 2012-13. (Figure 3-19) (COAI, Internet reading, Company reports) Moreover, additional costs coming from above mentioned challenges will also add further debt to debt ridden industry and it is estimated that owing to recent spectrum auctions and cost coming from modernisation efforts debt for 2014-15 is Rupees 3500 billion. Industry is at risk to become a low profit business and with average revenue per unit (ARPU) under downward trend margins are stretched.

![Telecom Industry Debt (US $ billion)](image)

**Figure 3-19 Mounting Debts in Telecom Industry**  
(Source: COAI, company reports, PWC)

With the surge of 3rd and 4th generation of technology trend are moving from voice to data services which are accelerating the growth of mobile telephony to new heights. The telecommunications sector would continue to contribute significantly to the growth of the Indian economy over the next few years. The growth in the spread of telecom infrastructure and provision of services is humungous and this rapid growth had resulted into some processes in supply chains which are modest as sector was prima facie revenue centric. There is a requirement that proactive steps must be taken to repair the situation and optimize these processes so that costs can be optimized.

### 3.8 ECOSYSTEM CHALLENGES

Managing a supply chain within a single county can be complicated due to multiple uncertainties in demand forecasting, supply and process. In developed economies,
uncertainties are comparatively limited as basic necessities to business such as power, roads, and water are not a challenge. However, in developing economies like India, these basic necessities are challenges. Most of the time successful well tested business cases in developed countries do fail in developing economies.

a. Issues in Infrastructure

There is growth in infrastructure in India in last 15-20 years but country still lags behind the growing business requirement. India is one of the fastest growing economies but ranks 95th on road quality and 82nd on port infra-structure quality (World Economic Forum, 2011). Average truck speed in India is 30 to 35 kilometres per hour which is half of that China’s 70-75 kilometres per hour (Kearney, May 2013). Average turnaround time at Indian sea ports is four days compared to six hours in Singapore. All above challenges force industry to maintain a higher system inventory which affects supply chain cost and availability of new products. Moreover, resolutions of these issues in infrastructure are going to take longer time as growth of infrastructure is time taking activity. Hence, these challenges are going to remain in system for some more time.

b. Logistics Service Provider Network

Third party logistics services in India are still in nascent stage and accounts for only 9 per cent of business compared to 80 per cent in Japan and 60 per cent in United States (Kearney, May 2013). Domestic players put more concentration on increasing the fleet size and try to work only on softer routes where quick revenues can be realised and lack capabilities for operations in challenging environmental and geographical conditions. Most of the trucks are operated by small fleet owners with less than five trucks. In the absence of this structured logistics service provider network, telecom service providers outsource logistics operations to equipment service providers who further outsource it to these small logistics service providers to transfer risks. This non-availability of reliable service providers / contract manufacturers can be recovered only if some big players come into this segment and develop processes to streamline the process but in order to meet the cost targets set
by these small logistic providers the process is going to be quite time consuming hence, similar situation is expected to be prevalent.

c. **Shortage of Skilled Supply Chain Professional**

Only 2 per cent of Indians have received formal vocational trainings (Kearney, May 2013). Also most of the organisations in the sector could not focus on building supply chain managerial capability and supply chain resources remain stuck on managing crisis of deliveries or inventories. Though expectations from supply chain are to build competitive advantage, but supply chain teams do not have the ability to achieve that. This supply chain capabilities build up is going to take time and gap is going to remain till the time, immediate steps are taken to repair the situation.

### 3.9 CONCLUSION

Indian is leading player in telecom world and one of biggest market globally. Telecom infrastructure had spread throughout country covering over approximately 95 per cent of country’s population. Key players of supply chain of the sector are associated with each other in intricate relationships as exhibited matrix in **Section 3.2**. The regulatory and policy changes of the government administered by regulatory frame work of country has played a key role in this extraordinary progression of the sector. In spite of huge demand of telecom equipment to cater to this sector, equipment manufacturing posted a grim picture with more than 95 per cent of equipment getting imported or being supplied by manufacturers having origin outside the country resulting in huge outflow of foreign exchange from country.

Huge data requirement in lieu of web conjunction, new generation of telecom devices, cyber threats, green telecom, and social development related application such as m-money, m-education, m-health and current regulatory scenario are major governing factors in the sector. Downward trend in subscriber growth, network reengineering requirement, maximising return on capital, data explosion, tough regulatory environment and electronic waste generation are identified as challenges being faced by the telecom sector. Considering the developing country’s ecosystem challenges such as infrastructure issues, logistics service provider network, and shortage of skilled supply chain professional specific to telecom sector it is
imperative to further study opportunities to optimise the cost which is attempted in this study as detailed in future chapters.