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Broadband Services in India : Problems and Prospects

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Abstract

According to the World Bank, 10% growth of broadband penetration rate will drive 1.4% growth of GDP (Gross Domestic Product). Government of India lunched it's an ambitious program "Digital India" on 1st June, 15. The success of this program depends totally upon ubiquity of broadband services in India. In the technological era of today, the "Broadband" has become the life line of internet users. It encompasses the technology and equipment for the digital delivery of voice, video and data services. It's clear that in a short time broadband has become a driver for all types of industries whether manufacturers or service providers. Definitely within these industries, broadband as a market driver has reached ubiquity but not up to the last mile user. Broadband's importance is certainly on the rise. It plays a significantly important role in the successful running of business, transparent and smooth functioning of Government but also day to day life of even a common man is governed by it. The global growth of electronic commerce shows that people are becoming increasingly dependent on the Internet for communications and all type of services.

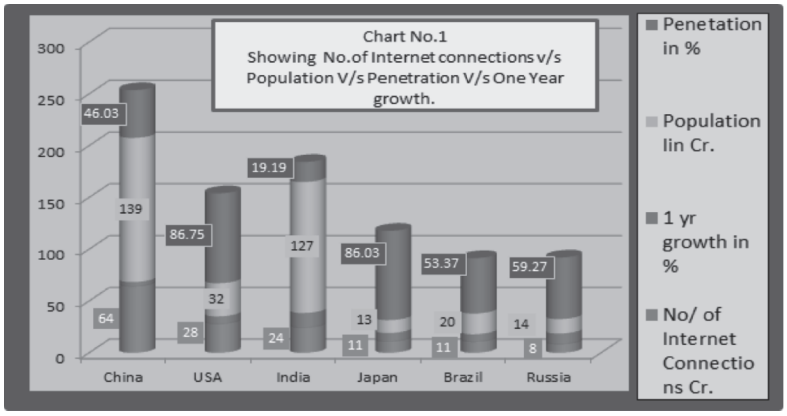
The main constraints in ubiquity are, limited availability of spectrum, higher tariff of Internet usages, non availability of last mile broadband connectivity, non availability of electricity, non availability of mobile networks, less awareness about e-Services and quality of services rendered. As on 30th April,2015, the wired broadband density was only 1.24% and wireless internet users are only 20 Crore.

This paper explores the above mentioned ubiquity constraints in detail and also compare Indian broadband services with that of other countries.

Key Words: Broadband, Digital India, Mobile, Quality of Service Spectrum, Tariff

Introduction

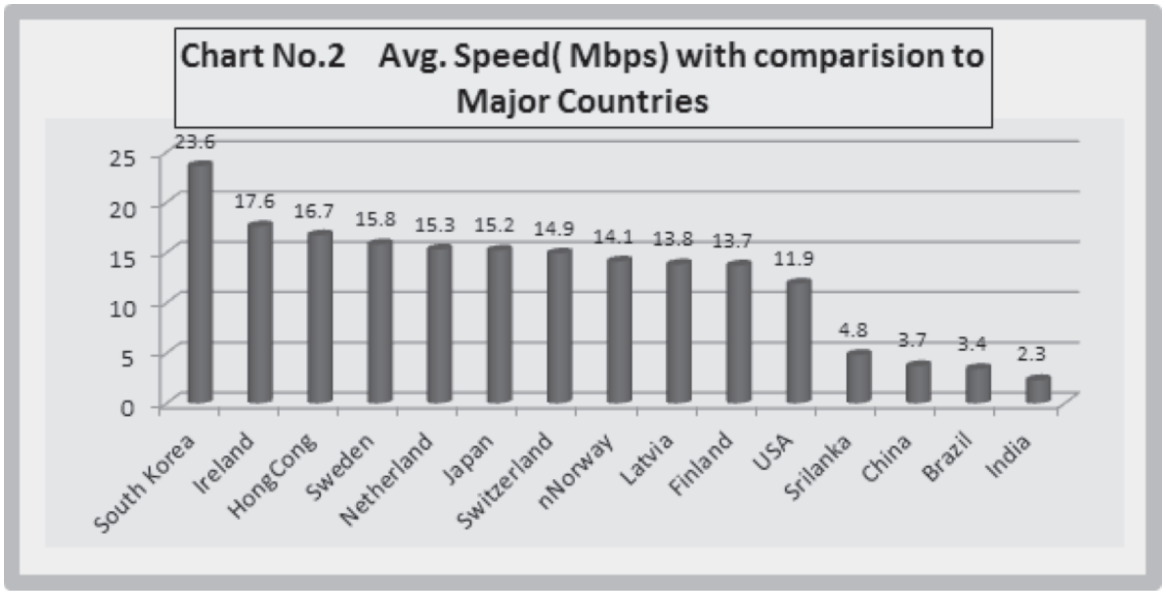
Broadband plays a critical role in an economy and contributes significantly to the development and social progress of a country. Broadband is regarded as key infrastructure for national development. Broadband deployment is the key driver for global economic growth. It increases not only competitiveness and productivity but also helps the economy to eliminate the social divide and achieve inclusive growth India has seen a multiple increase in internet users in the last couple of years, India is speedily becoming a digital nation. India has the highest yearly growth rate and currently has the third largest number of internet users globally but the penetration is only 19.19 %. The statistics are given below in Chart No.1.



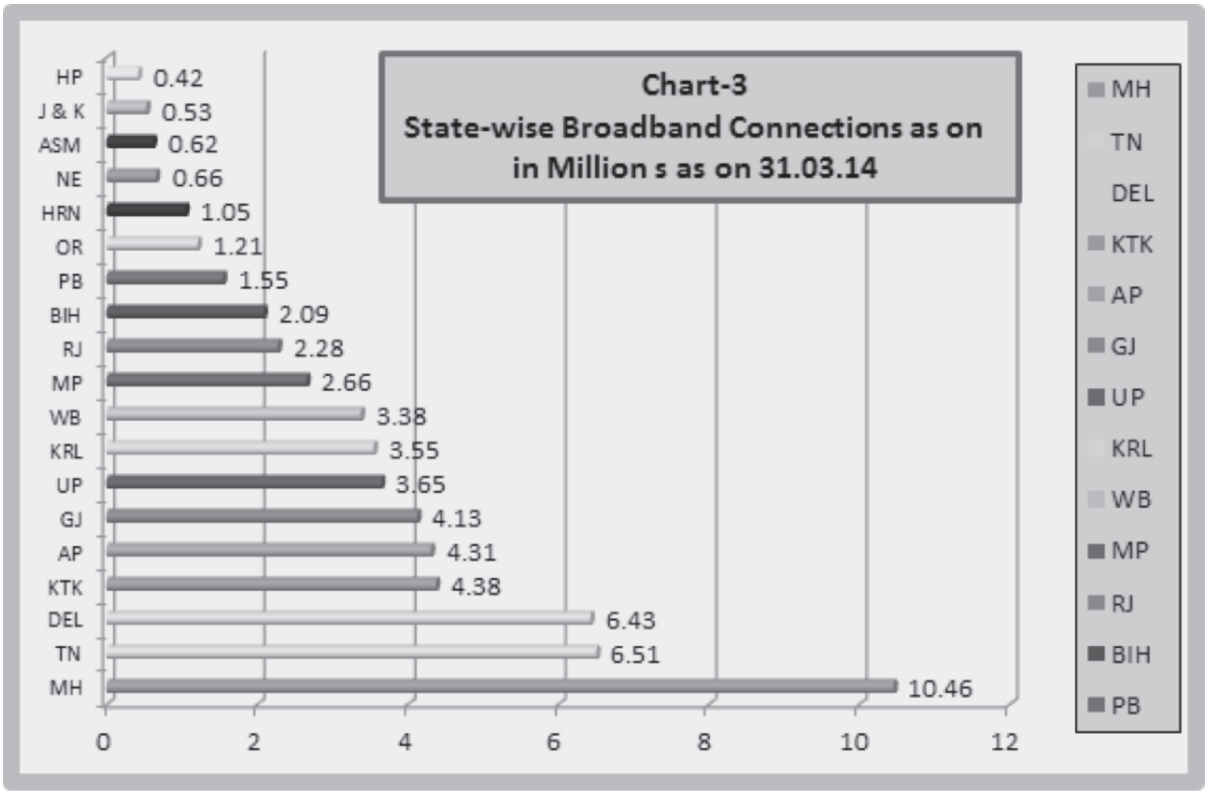
According to latest report of TRAI, total number of internet subscribers has increased from by 12.01% from December 2013 to reach 267.39 million in December 2014. On further analysis with the data, we see mobile internet users are the dominating segment among internet users. Among total internet subscribers, wired internet subscribers were 18.86 million (which registered yoy growth of 2.9%) and wireless internet subscribers were 248.53 million (which registered yoy growth 12.77%). Among wireless internet subscribers, mobile wireless (mobile and dongle) subscribers increased by 12.8% from 219.92 to 248.02 million in December 2014, whereas fixed wireless ((Wi-Fi, Wi-MAX, point-to-point radio and VSAT) subscribers increased very marginally by 0.73% to 0.46 million at the end of December 2014. It is clear that mainly smart phone penetration is boosting the internet usage across the country and internet usage on mobile devices has already exceeded PC usage. Cheaper and faster mobile networks, a rise in the number of users of these networks and more affordable 3G and 4G handsets will help to increase mobile data traffic. It is the true fact that the key driver of data growth on a global scale in mobile apps with billions of devices to be connected each other and the online healthcare and online retail spending expected to grow at a higher rate. Internet penetration in India is not only limited to urban area, approx 35% of internet users are from rural India also. At the end of December 2014, internet subscribers in rural area were 92.18 million with tele- density of 10.66 and internet subscribers in urban area were 175.21 million with tele-density of 45.33 . According to a study by Department of Electronics and Information Technology (DEIT), the Internet of Things (I.o.T.) industry in India is expected to be a $15 billion market by 2020 and it is expected that India would have a share of 5-6% of the global I.o.T. industry.

The biggest growth will come in e-Commerce, which will expand almost 5-fold, while education and healthcare via mobile internet will expand internet use. Internet growth would indeed motivate entrepreneurship and wealth creation due to the huge potential of untapped Indian market.

Until now, more than 110 countries have announced their broadband plan. Most of the developed counties have setup 100 Mbps as their broadband speed target for 2020. The present status of broadband speed in India w.r.t. other major countries are as shown in below Chart No-2 :



It is very clear from above graph that internet speed in India is only 2.3 Mbps while the South Korea is at first position with speed of 23.6 Mbps. If we further analyse the data, Maharashtra is at No.1 position with 10.46 million and Himachal Pradesh at last position with 0.42 million connections. (Chart No-3)



This status is not satisfactory at all. India formulated its first broadband plan in 2004. Further India launched its broadband plan 2012, in which vision up to 2020 has been coved. To achieve the targets, Bharat Broadband Network Limited has been formed.

What is Broadband ? :

A high-speed Internet access is generally called "Broadband". The D.o.T. (Department of Telecom) has revised the definition of Broadband through its notification. The revised definition of Broadband is as follows:

"Broadband is a data connection that is able to support interactive services including Internet access and has the capability of the minimum download speed of 512 kbps to an individual subscriber from the point of presence (POP) of the service provider intending to provide Broadband service."

National Telecom Policy-2012 (NTP-2012) has the vision "Broadband on Demand" and envisages leveraging telecom infrastructure to enable all citizens and businesses, both in rural and urban areas, to participate in the Internet and web economy thereby ensuring equitable and inclusive development across the nation. It provides the enabling framework for enhancing India's competitiveness in all spheres of the economy.

To provide affordable and reliable broadband-on-demand by the year 2015 and to achieve 175 million broadband connections by the year 2017 and 600 million by the year 2020 at minimum 2 Mbps download speed and making available higher speeds of at least 100 Mbps on demand. Provide high speed and high quality broadband access to all village Panchayats through a combination of technologies by the year 2014 and progressively to all villages and habitations by 2020." Further, Point 1.5 of part IV strategies contained in the National Telecom Policy-2012 states that**:**

"To revise the existing broadband download speed of 256 Kbps to 512 Kbps and subsequently to 2 Mbps by 2015 and higher speeds of at least 100 Mbps thereafter."

Major Objectives of NTP-12 :

- Increase rural teledensity from the current level of around 39 to 70 by the year 2017 and 100 by the year 2020.
- Provide affordable and reliable broadband-on-demand by the year 2015 at minimum 2 Mbps download speed and making available higher speeds of at least 100 Mbps on demand with quality of service.
- Simplify the licensing framework
- Strive to create One Nation - One License
- Recognize telecom as Infrastructure Sector

Most of the wired broadband connections are provided in India on DSL technology. DSL (Digital Subscriber Line) is considered the most available technology, which is widely used by leader in providing broadband services BSNL (Bharat Sanchar Nigam limited). Business and high end users prefer for Internet Leased line(ILL) services due to interrupted and high quality of services. Committed bandwidth is delivered in ILL services but charges are very high with compared to general broadband plans. On the other hand, wireless broadband access is a common element in service-providers' plans, end-users have not yet come to terms with wireless as a broadband option. The inequality in perceptions between service providers and end-users is mainly evident when considering the still promising 3G wireless in the context of broadband. Understanding broadband usage may help to explain some of these discrepancies. Growth in small business markets, remote branch offices and telecommuting are playing a crucial role in driving broadband demand. The result is that the line between business needs and consumer connectivity is blurring—and broadband is encompassing both requirements. Broadband technologies are increasingly important to the success of businesses of all sizes. Underlying trends in the business market, including growth of small businesses, telecommuters and remote branch offices, are accelerating the demand for broadband and driving a junction between broadband access in the home and in the office. As broadband demand turns into actual subscribers and as businesses integrate broadband into their business processes, the business community will accelerate its progression to broadband ubiquity.

Status of Telecommunication Services in India:

As shown in Table-1, total number of telephone and mobile connections have cross the mark of one billion as on 31st March,15. Out of these one billion connections, 975.74 million connections are based on mobile technology while 26.23 million connections are working on wired line technique. The Tele-density has reached to 80 %.

Table-1

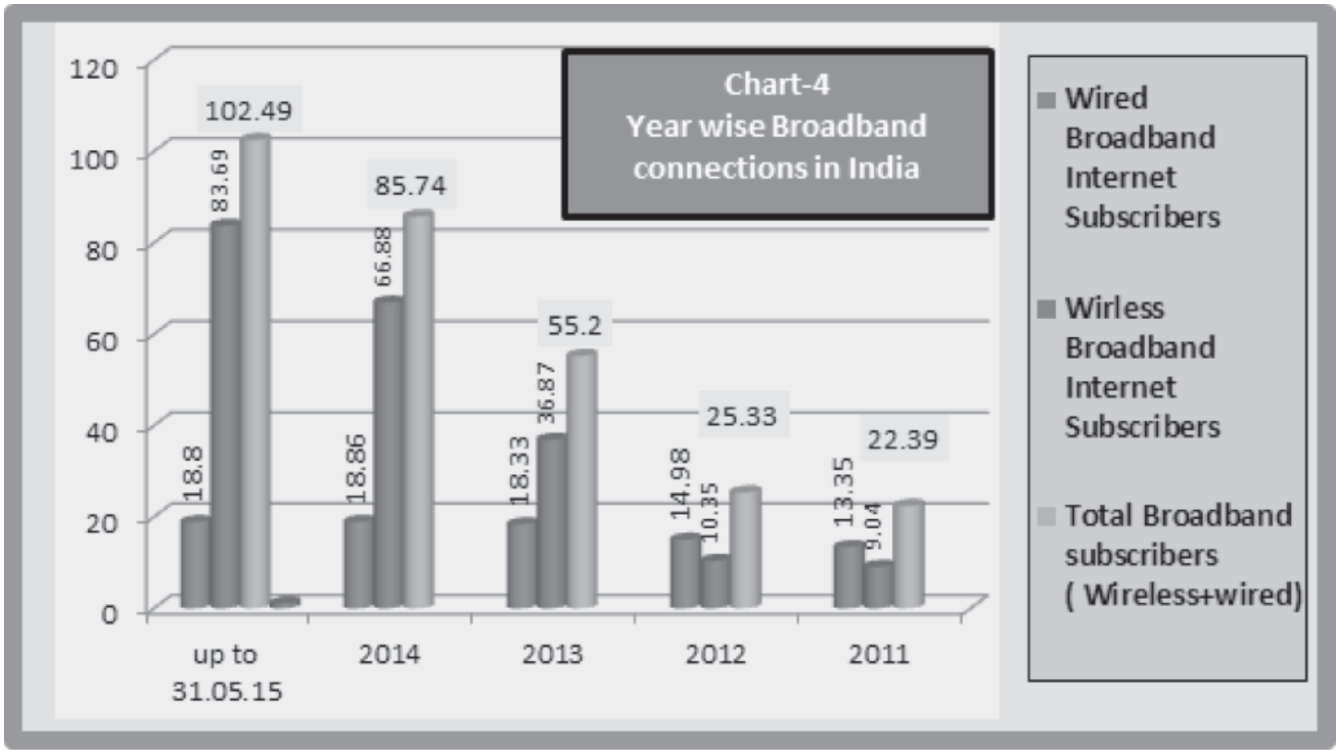
Highlights of Telecom Subscription Data as on 31st May, 2015 (in millions)

Particulars	Wireless	Wire line	Total (Wireless + Wire line)
Total Telephone Subscribers (Million)	975.74	26.23	1001.97
Tele density	80		
Broadband Subscribers	83.69	18.8	102.49

Internet service providers in India: Internet Service Providers (ISPs), Unified Access Service Licensees (UASLs) and Cellular Mobile Service Providers (CMSPs) are permitted to provide broadband access under the existing licensing framework. Up to 31.05.15, there are 102.49 million Subscribers have been reported by 121 operators. The growth of broadband connections in India, since 2011 has been shown in Table-2 with graphical representation in Chart No.-4 below:

Table-2

Type of Subscriber	up to 31.05.15	2014	2013	2012	2011
Wired Broadband Internet Subscribers	18.8	18.86	18.33	14.98	13.35
Wireless Broadband Internet Subscribers	83.69	66.88	36.87	10.35	9.04
Total Broadband subscribers (Wireless +wired)	102.49	85.74	55.2	25.33	22.39

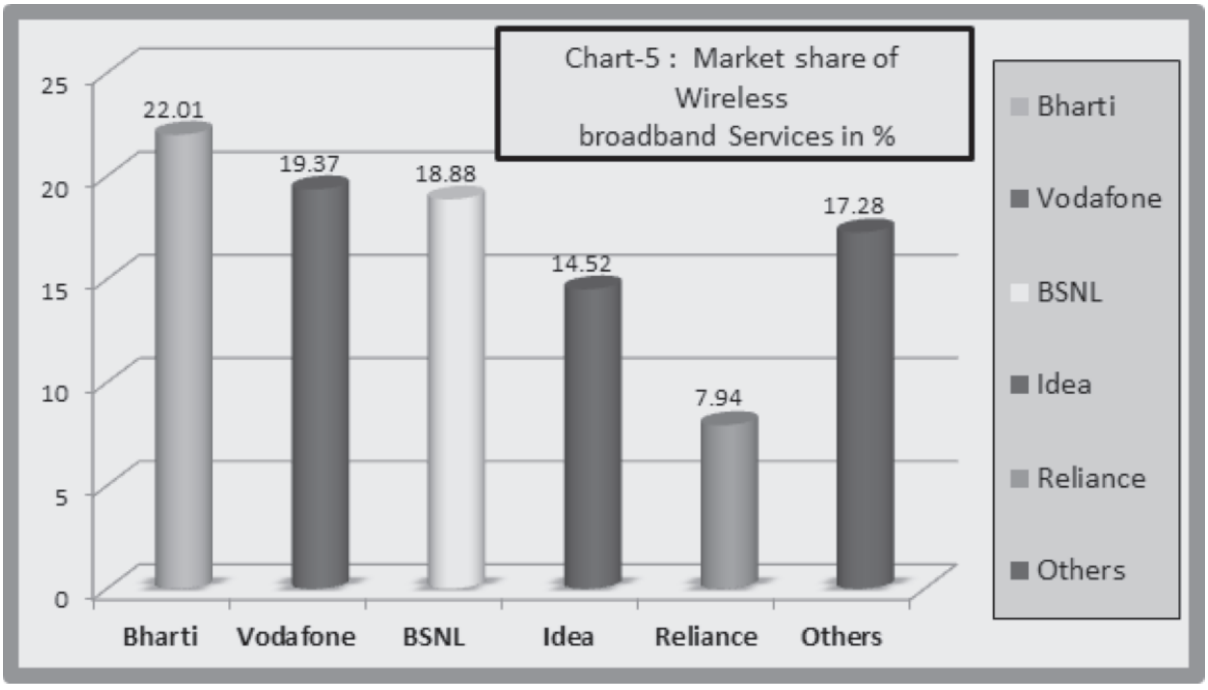


However, the top ten service providers account for about 97% of subscriber base and the top 5 service providers alone hold 83% market share. State owned companies viz. BSNL and MTNL together have about 74.9% market share for wire line broadband and 30.5% for overall broadband subscriptions. This suggests that despite having a license for providing broadband services, the majority of the service providers are either unwilling or unable to penetrate into the market and the market is still dominated by a few players only. The broadband service providers in India are given in Table-3 below:

Tabble-3

SN	Name of ISP	SN	Name of ISP
1	Skydoot Communications GJ	9	Railtel
2	Excell Media	10	STPI
3	Tata Communications	11	Powertel
4	Bharti Airtel	12	Tikona Digital Networks
5	Bharat Sanchar Nigam	13	Tulip Telecom
6	Reliance Communications	14	Uclix Infr Ltd
7	Vodafone India	15	Acws Global - Internet Services
8	GAILTEL	16	Delta UPS - UPS Service Provider Ezycare

Broadband Market share of various operators in India: Top five service providers constituted 83.39% market share of total wireless broadband subscribers at the end of Mar-15. These service providers were Bharti Airtel (22.01 million), Vodafone (19.37 million), BSNL (18.88 million), Idea Cellular Ltd (14.52 million) and Reliance Communications Group (7.94 million). Under broadband wired services there were 15,52 million connection on 31.03.15, out of which 9.96 million (64.2%) were provided by BSNL. The graphical representation is shown in Chart-5 below :



Research Objectives :

This paper is intended to provide insights into those key functional areas responsible for ubiquity of broadband services to the last mile man. Following constraints will be dealt in length to throw light on the topic :

Price Constraints:

Although broadband penetration is low in India, the entry level tariff for wired broadband services came down drastically from Rs.1500 per month in 2004 to around Rs.600 a month in 2012. But it has again started hiking since 2012 and onwards due to higher operational costs and less penetration. Most service providers charge a monthly rental between Rs.700 to Rs.1600 for a broadband connection and providing various packages for data transfer. Most service providers provide unlimited downloads. Same is the case with wireless broadband services. In 2008 one GB data was being offered in just Rs.100 with validity of one month but now the same is being offered in Rs.225-300 by various operators. It shows that rates have gone up three times. It is the need of time to reverse the tariff trends if we want the ubiquity of Broadband services. Additionally, economic studies have concluded that households that have adopted broadband Internet are far less price sensitive or "price elastic" than prospective adopters. Small price increases for current broadband subscribers (especially middle and high income subscribers) are unlikely to push them back to mobile 2G/3G internet services, but the higher prices can have a larger impact on the subscription choices of households that currently use mobile services and are looking to upgrade their service. In this respect, low income households are particularly price sensitive.

Driven by the conviction that the widespread use of broadband can support economic recovery and help the India achieve other important national goals. Prime Minister Mr. Modi has proposed that every Indian should have the opportunity to connect to broadband service. On his campaign of Digital India on 1st July,15, the PM declared: **"India should reach at par with the world in broadband penetration and Internet access"** and he promised to bring "true broadband to every community in India." through huge investment by Govt. and Private sector. Since last few years, a project named "National Optical Fiber Network" is being implemented to develop a national strategy to achieve universal broadband. In this regard 2.5 Lakh Gram Panchayats are being connected through broadband by "Bharat Net" program.

By historical standards, access to broadband already has progressed at a remarkable pace. The service was introduced just eleven years ago in early 2004. Businesses also has become wired for broadband at rapid rates, and millions of Indians also started using a growing variety of mobile devices to connect to the Internet with wireless broadband. These trends clearly show steady advances in both the deployment of broadband by service providers and the number of Indians subscribing to this high-capacity services .However, the data also show that the march towards universal broadband access has progressed unequally across demographic groups. More than a decade after the broadband services started, the existence of a "Digital divide" in Internet connectivity between urban and rural Indians and between low and high income groups, significant gaps remain.

These gaps present an important challenge to policymakers and obstacles to the goal of universal broadband. Given the growing trend by individuals to communicate online and the commitment of public and private institutions to shift services and communications to the Internet, any group that disproportionately lacks broadband-based Web communications operates at a significant disadvantage to their broadband-linked peers. Their economic opportunities are reduced; they are cut off from accessing emerging broadband-enabled health care and education services, and they will lack a increasingly prominent communications link with their government

These findings are supported by recent experience, which suggests that adoption would have been even higher in 2012 if the price increases had not occurred. As per TRAI report, for example, that almost one in ten Indians either cancelled or cut back Internet service for financial reasons between April 2012 and March 2014. As policymakers consider the future of broadband policy, they must try to determine whether the historic pattern of technology diffusion will replicate itself with broadband or whether the re-widening of the Internet access gap is a harbinger of new challenges. Specifically, they must ask themselves what would happen to adoption trends if Internet service providers change their consumer pricing models to accommodate additional costs arising from expanded demand for bandwidth.

Policy Constraints :

Given the national commitment to achieving universal broadband and considering the growing hunger for online communication, it seems likely that at some future date every Indian who wants broadband at home will have it. How soon that day will arrive is less clear. Our analysis suggests that the pace at which Indians achieve universal broadband access could differ greatly, depending on economic factors and policy choices including policies that affect how broadband providers' liberation the costs of the additional investment needed to expand broadband capacity. On the one hand, the amount of private investment required to ensure that the network can keep pace with growing demand is a key variable. But how that investment is financed, and the extent to which those costs fall on lower-income and middle-income consumers, will be equally important to the goal of universal access. To the extent that lower-income and middle-income consumers are required to pay a greater share of network upgrade costs, we should expect a substantial delay in achieving universal broadband access. Our simulations suggest that spreading the costs equally among all consumers – the minority who use large amounts of bandwidth and the majority who use very little – will significantly slow the rate of adoption at the lower end of the income scale and extend the life of the digital divide.

If costs are shifted more heavily to those who use the most bandwidth and, therefore, are most responsible for driving up the cost of expanding network capabilities, the digital divergence among the races and among income groups can be eliminated much sooner.

The New Telecom Policy 1999 had been a catalyst for growth of the telecom sector . Now National Telecom Policy-2012 is designed to ensure that India plays this role effectively and transforms the socio-economic scenario through accelerated equitable and inclusive economic growth by laying special importance on providing reasonable and quality telecommunication services in rural and remote areas. NTP-2012 is an initiative to create a favorable policy framework to address these issues and to touch lives of all citizens and transform India. NTP 2012 is conceived against this backdrop. The vision is to transform the country into an empowered and inclusive knowledge-based society, using telecommunications as a platform.

Spectrum Constraints :

In India, the Indian Telegraph Act, 1885 and the Indian Wireless Telegraphy Act, 1933 and the related rules and procedures provide the legal basis for spectrum management. The National Frequency Allocation Plan (NFAP) 1981, and subsequent revisions or amendments, derived from the Table of Frequency Allocations of the Radio Regulations, in consultation with the national users through the forum of Standing Advisory Committee on Radio Frequency Allocations (SACFA), provides the basis for assignment of frequencies .The frequencies are assigned by wireless planning and coordination (WPC) wing from the designated bands prescribed in National Frequency Allocation Plan - 2000 (NFAP-2000). Appropriate

frequency spots in GSM band of 890-915 MHz paired with 935-960 MHz are assigned to operators selected for vacant slots and 1710-1785 MHz paired with 1805-1880 MHz are assigned to fourth cellular operator. A cumulative maximum of up to 4.4 MHz + 4.4 MHz will be permitted. Based on usage, justification and availability, additional spectrum up to 1.8 MHz + 1.8 MHz making a total of 6.2 MHz +6.2 MHz, may be considered for assignment, on case by case basis, on payment of additional license fee. The frequencies assigned may not be contiguous and may not be same in all cases, while efforts would be made to make available larger chunks to the extent feasible.

In Dec-1994, 34 licenses were issued in 20 circles (Broadly speaking a Geographical Area) and 8 licenses in Metros by D.o.T. for a period of 10 years, expendable by 5 years. In the Metros the licensees have each been allocated 4.5MHz in the 900 MHz spectrum and in the circles the allocation is 4.4MHz. Therefore, in January, 1997, the Telecom Regulatory Authority of India (TRAI) came into being solely for the purpose of regulation through an act of the Parliament. In 2008, 122 new second generation (2G) Unified Access Service (UAS) licenses were awarded on FCFS basis to telecom companies at 2001 prices.

Among the recent auctions, the 3G and 4G telecom spectrum were auctioned in a extremely aggressive bidding in 2010. Tata Docomo was the first private operator to launch 3G services in India. The Government earned a total revenue of over Rs.106219 Crores (US$19 billion) from the 3G and the Broadband Wireless auctions. In 2012, the D.o.T. auctioned 2G spectrum in both GSM and CDMA bands. The government received bids worth a total of 9,407 Crores, far lower than its target of 28000 Crores from the sale of 2G spectrum in the GSM band. None of the bidders bid for a pan-India spectrum for which the reserve price was set at Rs140 billion for 5 MHz of airwaves. In March, 2013, the D.o.T. auctioned 2G spectrum in GSM (1800 MHz) and CDMA (800 MHz) bands. Response to the 2013 spectrum auction was poor. While there were no bidders for spectrum in 1800 MHz and 900 MHz bands, Sistema Shyam Teleservices Ltd. (SSTL), which is also known as MTS was the only bidder for airwaves in 800 MHz band. Some companies complained about the very high reserve prices that, according to them, have deterred entry of many potential bidders.

India's 2015 spectrum auction concluded on March 25, after 19 days and 115 rounds of bidding. Bharti Airtel has **acquired 111.6 MHz of spectrum** across 900 MHz, 1800 MHz and 2100 MHz bands for a total consideration of **Rs 29,130 Crore** in the just concluded spectrum auction. Of this, Rs 17,618 Crore has been spent on renewal of existing spectrum, while the remaining Rs 11,512 Crore has been spent on procuring new spectrum.

Vodafone India says it has bought spectrum in all six of its 900 MHz circles due for extension in December 2015 – Gujarat, Haryana, Kerala, Maharashtra, Rajasthan and Uttar Pradesh (East). It has also acquired 5 MHz of 900 MHz band spectrum in Odisha, and 30 MHz of spectrum in the 2100 MHz band in six new circles. Vodafone is **spending a total Rs 25,810 Crore in this auction** .

Total bids by R.Com in the spectrum auctions amount to **Rs 4,299 Crore, of which almost 50% was spent on acquiring spectrum in the 800 MHz band.** The company will be making an upfront payment of Rs 1,106 Crore.

Reliance Jio says it plans to provide 4G services using LTE in 800MHz, 1800MHz and 2300MHz bands through an integrated ecosystem. After this auction the **company has spectrum in either 800MHz or 1800MHz or both in 20 out of total 22 circles in the country.** Reliance Jio Infocomm has to pay a **total Rs 10,077.53 Crore for the spectrum acquired, of which 26.75% or Rs 2,695 Crore is being paid initially** and the remaining through ten annual installments after the two year moratorium. The Govt. earned approx. Rs 1,18,500 Crore by the spectrum auction in March 2015.

As it clear from above facts that companies have quoted very high prizes for obtaining spectrum, and it is dead sure that the effect of this over prizing will reflect in broadband plans which will be offered to customers. The third quarter *Akamai State of the Internet* report, released on 9 January, India was the country with the lowest high broadband adoption rate in the third quarter, at 1.1%. Colombia, which had the lowest adoption rate in the previous quarter, saw a 2.4% quarterly increase and had a high broadband adoption rate just four-hundredths of a per cent higher than India. Further, while most nine of the 14 surveyed Asia-Pacific countries and regions, in the Akamai report, had average connection speeds above the 4 mbps broadband threshold, India remained the country with the lowest average connection speed in the region at 2 mbps. Only 1.1% of users had download bandwidth speeds of over 10 mbps and a mere 6.9% had a bandwidth speed of over 4 mbps India's peak download speed in the third quarter stood at 13.9 mbps, ranking it 113 in the overall list while Hong Kong came first with a 84.6 mbps peak download speed and an average broadband speed of 16.3 mbps. South Korea was ranked first with an average broadband download speed of 25.3 mbps. Moreover, the Philippines and India were the only two countries within the Asia-Pacific region with broadband adoption rates below 10%, at 8.8% and 6.9% adoption respectively. India's Internet users will soon cross 300 million. A majority of these will access cyberspace on the mobiles, be they smart phones or tablets, at 3G (third

generation) and even 4G (fourth generation) speeds. Unfortunately, most telecom services providers almost halve the download speeds after users reach a pre-defined limit of data download (say 3G or 10GB). This, in turn, reduces the average broadband speeds, making transactions like mobile banking, etc., very difficult to achieve. With even Indian Telcos like Airtel applying for payments bank licenses, it is only but fair that broadband speeds are redefined

Besides, it's hard to imagine how India will make successful Smart Cities with poor Internet speeds, since much of the success of a Smart City will depend on accessing information instantly from voice, data and videos—and all of this without any broadband hiccups.

Electricity Constraint :

The utility electricity sector in India had an installed capacity of 271.722 GW as of end March 2015. Renewable Power plants constituted 28% of total installed capacity and Non-Renewable Power Plants constituted the remaining 72%. The gross electricity generated by utilities is 1106 TWh (Terawatt-hours) (1106,000 Giga Watt hrs.) and 166 TWh by captive power plants during the 2014–15 fiscal. The gross electricity generation includes auxiliary power consumption of power generation plants. India became the world's third largest producer of electricity in the year 2013 with 4.8% global share in electricity generation surpassing Japan and Russia.

During the year 2014-15, the per capita electricity consumption in India was 1010 kWh with total electricity consumption (utilities and non utilities) of 938.823 billion kWh. Electric energy consumption in agriculture was recorded highest (18.45%) in 2014-15 among all countries. The per capita electricity consumption is lower compared to many countries despite cheaper electricity tariff in India. Of the 1.4 billion people of the world who have no access to electricity in the world, India accounts for over 300 million. The International Energy Agency estimates India will add between 600 GW to 1,200 GW of additional new power generation capacity before 2050. Approx. 80% of Indian villages have at least an electricity line, just 52.5% of rural households have access to electricity. In urban areas, the access to electricity is 93.1% in 2008. The overall electrification rate in India is 64.5% while 35.5% of the population still lives without access to electricity. The demand will further raise due to:

India's manufacturing sector is likely to grow faster than in the past

Domestic demand will increase more rapidly as the quality of life for more Indians improve

About 125,000 villages are likely to get connected to India's electricity grid

Blackouts and load shedding artificially suppresses demand; this demand will be sought as revenue potential by power distribution companies in December 2011, over 300 million Indian citizens had no access to frequent electricity. Over one third of India's rural population lacked electricity, as did 6% of the urban population. Of those who did have access to electricity in India, the supply was intermittent and unreliable. In 2010, blackouts and power shedding interrupted irrigation and manufacturing across the country States such as Gujarat, Madhya Pradesh, etc. provide continuous power supply.

In above situation it is very challengeable for government to provide electricity to all the villages for at least 18 hrs a day. The universality of broadband can't be talked till we ensure proper electricity up the last mile village.

Broadband Connectivity Constraints:

As we have discussed in introduction that only 0.0144 % population have wired broadband connectivity and 21.44 % have access to internet. To improve the situation it is required to lower down the tariff, implementation of NTP-12 in true sense through National Optical Fiber Network and Digital India Program.

National Optical Fiber Network (NOFN) : It is a plan to connect all the 2,50,000 Gram Panchayats in the country. This will be done by utilizing existing fibres of PSUs (BSNL, Railtel and Power Grid) and laying incremental fibre to connect to Gram Panchayats wherever necessary. Dark fibre network thus created will be lit by appropriate technology thus creating sufficient bandwidth at the Gram Panchayats. This will be called the National Optical Fibre Network (NOFN). Thus connectivity gap between Gram Panchayats and Blocks will be filled. Non-discriminatory access to the NOFN will be provided to all the Service Providers. These service providers like Telecom Service Providers(TSPs), ISPs, Cable TV operators and Content providers can launch various services in rural areas. Various categories of applications like e-health, e-education and e-governance etc. can be provided by these operators. The NOFN project is estimated to cost about Rs. 20,000 Cr. It is proposed to be completed in 2 years' time. The project will be funded by the Universal Service Obligation Fund (USOF). The major high lights of NOFN are :

World's largest rural broadband connectivity project through

optical fibre

2.5 Lakh Gram Panchayats in India to be connected on optical fibre

Minimum 100 Mbps bandwidth at each Gram Panchayat

NOFN to be Non-discriminatory Access infrastructure for all

Service Providers

Approx 6 Lakh Km new incremental optical fibre cable to be laid

Indigenous equipment design and manufacturing under "Make in

India"

Optimizing the usage of existing resources Optical fibre

GPON technology is being used for the first time in a geographically widespread country such as India

Geographical Information system (GIS) to map with planning, designing and marketing of the services.

Centrally located High Capacity Network operation Centre (NOC) for network management (NMS) to monitor and ensure the up time and provisioning.

Wi-Fi connectivity at each ONT to ensure spread.

Digital India: Digital India is an initiative of the Government of India to integrate the government departments and the people of India to ensure effective governance. It also aims at ensuring that the government services are made available to citizens electronically by reducing paperwork. The initiative also includes a plan to connect rural areas under high-speed internet networks.

The program also aims at providing digital infrastructure as a utility to every citizen as well as high-speed internet as a core utility in all Gram Panchayats through NOFN. On its completion, NOFN is expected to facilitate broadband connectivity to over 600 million rural citizens of the country.

Mobile Network Constraints :

According to the data provided D.o.T., India has total 7,36,654 base transceiver stations (BTS -2G GSM and CDMA and 3G Mobile Towers) while out of that only 96,212 BTSs have been installed to provide 3G mobile and data services in the country till the 30 November 2012. Presently for 3G mobile and data services, Tamil Nadu circle has maximum of 9,350 BTSs, followed by Delhi and NCR with 8,405 BTSs, Maharashtra and Goa (Excluding Mumbai) with 8,377 BTSs (Base Tower Stations). Mumbai had 6,622 BTSs for 3G services as on November 30, 2012. Out of 640 districts of India, 610 districts are being covered by 3G services as on November 2012. As per present 3G service rolls out norms, mobile operators that have won 3G spectrum in 2010, are required to provide street level coverage in at least 90% of service area in Metros within 5 years of the date (till 2015) they were allocated 3G spectrum. For other than Metro circles, operators are required to cover 50 per cent of district headquarters (DHQs) which should be 90% of the area bounded by municipal or local body (Panchayat – Jila Parishad) limits till the year of 2015. It seems that uptake of 3G services is also hampered by the fact that no 3G operator covering the entire country or not providing street level indoor and outdoor 3G coverage in all circles across India. China has approx. 10 lakh mobile towers and planning to double it in next few years.

Fourth generation is the fourth generation of mobile telecommunications technology. A 4G system, in addition to the usual voice and other services of 3G, provides mobile broadband Internet access, for example to laptops with wireless modems, to smart phones, and to other mobile devices. Potential and current applications include amended mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing, 3D television, and cloud computing. The 4G systems are commercially deployed by Mobile Wi-MAX technology (Worldwide Interoperability for Microwave access), and the first-release Long Term Evolution (LTE) standard. These techniques are being used by South Korea and Sweden. In India Airtel and Videocon have already launched 4G in many Metros/Major towns while Reliance Jio is providing its 4G Services in many states free of cost under trial.

To Sum up : Rapid growth of global broadband traffic and emerging services such as cloud computing are has putting new requirements to the broadband network and drive for new network infrastructures. It clear from above discussion that India is growing very rapidly to cover the gape of digital divide. If the targets of NTP-12 are to be achieved, Government and private sectors both have to do a lot of work in this direction. The government should liberalize the policies to attract more and more technological investment in broadband infrastructure. The companies should be provided hurdle free environment to invest. The returns may be assured in some way. On the other hand PSUs like BSNL, MTNL and BBNL should be given free hand in deciding policies and on financial issues. Similarly government has to take many initiatives to provide electricity to the last mile village, otherwise the " Digital India " drive will remain a

dream only. Non renewable energy resources are reducing day by day. The focus of Govt. should be on renewable energy sources only which includes nuclear and solar energy. The government should also encourage private operators to discharge their social responsibilities by offering cheaper broadband/Internet plans to BPL (Below Poverty Line Society) .

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