UPGRADATION OF TECHNOLOGY IN BROADBAND SEGMENT FOR WIRELINE & MOBILE BROADBAND SERVICES

(A Study of customer perspective)

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Abstract: Technologies relating to technical areas namely Information, Communication, Computer and Telephone have, of late, been integrated to serve the needs of not only personal segment but also of business and marketing. Digital Marketing is the new genre; much more sophistication and diversification is awaiting in the wings because the scientists and technocrats are burning mid-night oil to offer innovated and latest tools and techniques for serving society better – more satisfactorily with ease and fun. This paper contains a study of the future trends in extending Broadband services in India on various Technologies that are being offered by different Telecom Operators in the country and customers' perceptions and expectations. Forecast of these trends of Broadband segment is also based on the vision documents of Government of India published in New Telecom Policy 2018 which has been given new title as 'National Digital Communication Policy 2018'. As per that policy, the Government wants to offer Broadband services up to 50 Mbps. This is going to be a huge shift of Broadband definition from the present standard of Broadband speed of 512 kbps which is just half in terms of Mbps compared to 50 Mbps. This shift to 50 Mbps is going to create 2nd Telecom revolution in India which will be catered by Fibre to Home(FTH) and 5th Generation 5G-Mobile services. Satellites pressed into communication with digitalization has made such shift possible and more amusing. It need hardly an emphasis that Broadband plays a critical role in an economy and also contributes significantly to the general development and social progress of a country. The proliferation of Broadband in a country is driven by a number of social, economical and technological factors because of real time application and high degree of reliability due to access to Internet. Internet service-applications through a reliable broadband network will have a huge economic impact in the future. In the present knowledge society, timely, accurate and relevant information is the key to success in the world of work and in International interaction. This being so, data availability (storage, mining and manipulation on the basis of Data Base Management systems), especially with high speed processing and transmission has become the life blood of emerging sophisticated rather prismatic human society. This is attributed to science & technology which has facilitated prompt, accurate, timely and adequate information and transaction facilitation in business, industry, services including banking.

Index Terms: Telecom; Broadband; FTTH , 3G , 4G, 5G Technology; Data Connectivity; Telecom Spectrum; Air Interface; Data Base Management System..

I. INTRODUCTION

Information and Communication technology havetogether come a long way from manually operating system to automatic connectivity – dialing numbers to mobile phoning and from paging, cell phone to mobile telephone gadget/device with multiple features (memory, calculator, calendar, clock, alarm, internet services, video, entertainment including chatting, social media like face-book, and many more). In telephony, we have entered 4G and broadband connectivity. All in all, the society today has made itself so used to using sophisticated telecommunication services that the world would otherwise collapse if these services were taken away. The reason for the tremendous growth of telecommunications is because we needed a better way to relay messages to each other to remain connected. No wonder that one may miss a meal but not recharging mobile phone for Data than voice .

1.1 Objective of the Study:

   a. *To find out the importance of Broadband servicesin current Scenario in India.*
   b. *To find out the Definition of Broadband and the available Technologiesand its growth rate.*
   c. *To find out the Future Trends in this segment in Changed Telecom Scenario in India.*
   d. *To find out Customers' Expectations and preference of Technology in Broadband/Data Connectivity.*

II. IMPORTANCE OF BROADBAND:
Internet began as a means of transmission of electronic information from a room sized computer to another room sized computer.It has transformed into an omnipresent global system of interconnected computer networks. Such networks link several billion devices worldwide. Every minute, hundreds of millions of people are creating and consuming an enormous amount of digital content. As digital connectivity reaches the far corners of the globe, netizens are using it to improve a wide range of inadequately efficient markets, systems, procedures and behaviors. Broadband plays a critical role in an economy and contributes significantly to the development and social progress of a country; same can be said of India. It not only assists in increasing competitiveness and productivity but also helps the economy to eliminate the social divide and achieve inclusive growth[1].

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[1]TRAI Consultation Paper on Delivering Broadband Quickly: What do we need to do?
http://www.trai.gov.in/WriteReaddata/ConsultationPaper/Document/Consultation%20Paper%20on%20Broadband%2024Sep2014.pdf

After interviewing about 10 closely located but engaged in diverse occupations, the researcher has come to understanding that they perceived Broadband as a tool for improving the life of the people by providing affordable and equitable access to information and knowledge and contributing for making them eco-friendly.

For individuals, broadband has direct impact on their day to day life style and behaviour. For the state, it contributes enormously towards trade (e-commerce) and generation of employment. Governments find it as a powerful tool to manage municipal services, provide improved governance (infusing enhanced transparency and full disclosures), increase participation of the masses in e-democracy, and also in effectively monitoring implementation of projects**.**

The proliferation of Broadband in a country is driven by a number of social, economic and technological factors. Access to Internet and its service-applications through a reliable broadband network will have a huge economic impact in the future. As per McKinsey Global Institute estimate, the potential economic impact of Internet based technology in terms of consumer surplus will range from $ 13 to $ 30 trillion by 2025. The share of developing countries in this economic impact is estimated approximately 43.2%. Therefore, the need for inclusive growth has never been felt more than today. It is important to include the large rural population in the country in governance and decision making process to inculcate a sense of participation and self-determination. It is equally important to provide life enhancing urban-like amenities to the rural population in areas like health, education and entertainment through channels like e-chaupal. According to the World Bank's estimates, a 10% increase in broadband penetration accelerates economic growth by 1.38% in developing countries. It is, therefore, natural that countries around the world are concerned about creating a robust broadband infrastructure that would sustain high growth of broadband services. Convergence of communications, media and IT is driving a host of new broadband services and creating new revenue streams across sectors and industries. For a country like India, the Government can play a critical role in diffusion of modern ICT such as broadband. NTP-2012 recognized telecom, including broadband connectivity as a basic necessityin areas like education and health and envisaged steps towards 'Right to Broadband'[2].

In view of the above discussion, though brief, it can be said that Data especially with High Speed has become the life blood of human society. All kinds of information can be received and passed promptly, accurately and with ease with the use of modern technology – Internet, Web, and various other devices and techniques. There are various Technologies which provide High Speed Broadband Data Connectivity i.e. . 4G, Wireless Broadband, Wireline Broadband and Fiber to Home Technology i.e. FTTH

The Voice Communication which was main revenue source of all the major Telecom operator in India is getting dried out due to deleting profits , it has become very important to reorient to Data communication due to growing demand for the same. Revenue share of BSNL too going down which was lately relying on its Wireline broadband network of its CFA segment.

Demand of wireless Broadband has gone up due to its convenience. Air Interface is shared interface and hence high speed data for one customer is a high amount of noise to the other when the same spectrum is used by all user-public. To prevent all limitations, we need to move in direction wherein Fibre is used extensively in access network to provide High Speed Data Network which is capable of handling higher bandwidth .

III. DEFINITION OF BROADBAND&TECHNOLOGIES:

Broadband Data Speed in India is of 512 kbps or higher, it is offered on two platforms i.e. wireless and Wireline.

3.1 Wireless/Mobile Cellular Broadband

3G Mobile providesdata Connectivity upto 2 Mbps.

4G Mobile provides data connectivity upto 20 Mbps.

5G Mobile provides Ultra Mobile Broadband with the speed around 200 times more than that of 4G.

5G is the 5th generation in cellular networks. The first generation began in the 1990s when cellular networks were being established. The second generation began with the first text messages. The third generation was marked by the first phones that could browse the internet. The current 4G period has seen faster, more reliable cellular networks, and phones that can stream content like Netflix.

4G and 5G are essentially standards for speed and connection. Many providers have difficulty achieving the standards for 4G, so they have added LTE (long-term evolution) to their network description. Using LTE allows them to say that they intend to deliver the speeds required to be 4G. LTE is used in much of the discussion around 5G as well.

5G promises cellular networks that can accommodate widespread implementation of the Internet of Things (IoT).5G network will be 200 times faster than their current 4G LTE network.

That speed could compete with Opticalwired broadband, but there are many reasons that 5G won't replace fibre and copper cable anytime soon. Device compatibility, service flexibility, security, and service coverage are factors that will slow the so-called 5G revolution. Timing is an issue as well.

3.2 Wireline Broadband

Starts from 512 kbps to 24 Mbps on conventionalCopper Network.

Higher Bandwidth can be provided on Optical Fibre Wireline Platform called FTTH Technology which can go up to 100 Mpbs and beyond.

Fibre to The Home (**FTTH**), also called "fibre to The Premises" (FTTP), is the installation and use of optical fibre from a central point directly to individual buildings such as residences, apartment buildings and businesses to provide unprecedented high-speed Internet access.

Data growth in the Indian telecom market has reduced the prominence of traditional Wireline broadband technologies such as digital subscriber line and cable modem. These technologies are not efficient enough to meet the customers' demand for high-bandwidth applications such as high speed internet access, video-on-demand, high definition TV, IPTV and online gaming. In this scenario, Fibre-To-The-home (FTTH) technology, which offers advantages like high bandwidth capacity and the delivery of high speed, high

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[2]Press Release on Indian Telecom Services Performance Indicator Report for the Quarter ending June, 2016 ;
http://trai.gov.in/WriteReadData/PressRealease/Document/Quarterly_Eng_Press_Release_01_12_2016.pdf

quality and multi-play services (data, voice and video) through a single channel, presents a strong business opportunity for telecom Operators

FTTH networks' ability to deliver high bandwidth has made investments in this infrastructure very important for operators. They are increasingly deploying FTTH technology to complement their wireless networks. Spectrum crunch is another major factor that has led operators to look for viable alternative mediums. Also, to achieve the broadband targets set by the government under the National Telecom Policy, it will be important to drive FTTH growth along with other technologies.

T.V. Ramachandran, President, Broadband India Forum and Chairman, FTTH India Conference Committee, says, "In the past couple of years, India has perhaps witnessed one of the fastest rates of growth in the world when it comes to connectivity. The internet revolution in the recent years was led by mobile-led broadband. However, for India to truly make its mark in the digital arena globallyhas to unleash the power of fibre connectivity. The Indian internet 2.0 revolution will be led by the fibre optics network – and it is the right time galvanize the focus and intellect of the industryas a whole to set sight on the future."

As part of its 2022 goals, the Indian government aims to provide high bandwidth speed (50Mbps connectivity throughout the country), create four million jobs, and increase the GDP contribution of digital communications to 8 percent (from 6% in 2017). These objectives are ambitious considering that the telecom industry currently faces crushing debt, high labour costs, and network performance issues .

An FTTH service helps to expedite operators' entry into new markets like home automation, home surveillance, and digital TV services. In the near term, one intriguing opportunity for vendors – whether local or not – is in fixed broadband, where FTTH rollouts are underway at several companies, including Reliance Jio, Bharti Airtel, and BSNL.

Bharat Fiber is Brand name for FTTH being offered by BSNL is a unique technology being deployed by BSNL for the first time in India. The fibre connectivity having unlimited bandwidth and state of the art technology provides fix access platform to deliver the high speed broadband from 512 Kbps to 100 Mbps, IPTV having different type of contents like HDTV and future coming 3D TV and range of voice telephony services. It provides a comprehensive solution for the IP leased line, internet, Closed User Group (CUG), MPLS-VPN, VoIP, video conferencing, video calls etc whatever the services available on the internet platform, bandwidth on demand can be delivered by this connectivity to the without changing the access fibre and home device. Customer will get a CPE called Home Optical Network Termination (HONT) consisting of 4X100 Mpbs Ethernet ports and 2 normal telephone ports. Each 100 Mbps ports will provide broadband, IPTVs, IP Video call and leased line etc as required by the customers.

The New Telecom Policy 2018 which has been renamed as National Digital Communications Policy-2018, seeks to unlock the transformative power of digital communications networks - to achieve the goal of digital empowerment and improved well-being of the people of India. In its main objectives it envisages the Broadband for all by 2022 and provide Universal broadband connectivity at 50Mbps to every citizen &Enable fixed line broadband access to 50% of households in India & Enable100 Mbps broadband on demand to all key development institutions; including all educational institutions. According to Telecom Secretary Aruna Sundararajan after unveiling New Telecom policy in 2018 said "Department of Telecommunications plans to focus on rationalizing licence and spectrum usage charges and the Universal Services Obligation Fund and highlighted that fibre connectivity was critical to the sector's growth,since 90% of Indians get their connectivity from airwaves, dependency on spectrum has to be reduced", which is why the New Telecom Policy emphasises on fibre connectivity.

Growth Data of December 2018 and April 2019 was analyzed to check addition of Wireline and wireless customers respectively in India and market Share of Broadband which includes Wireline and wireless customers.

Access Service Provider-wise Market Shares in term of Wireless Subscribers as on 31st December, 2018
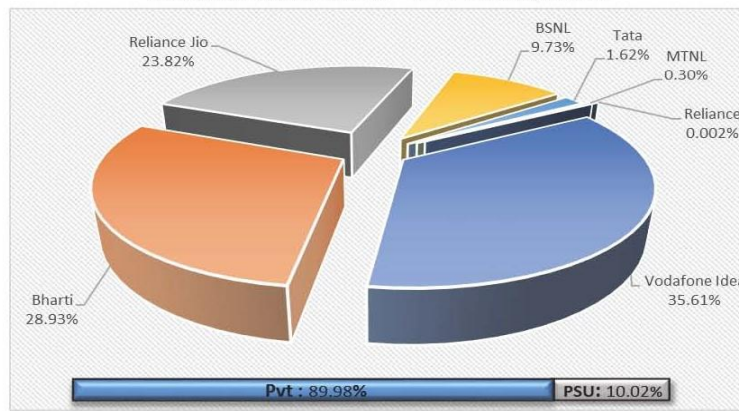
Net Additions in Wireless Subscribers of Access Service Providers in the Month of December, 2018
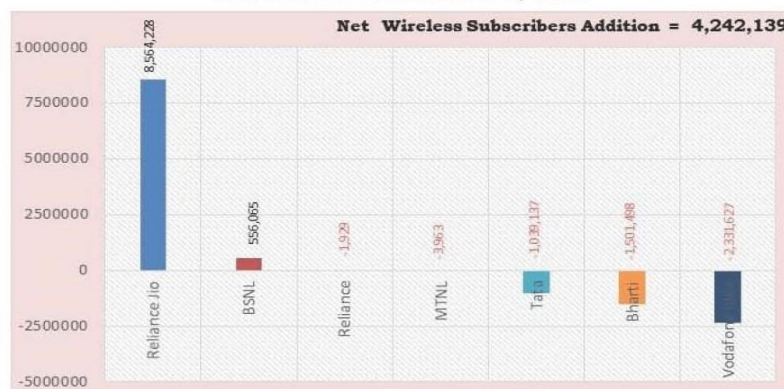
Source : https://main.trai.gov.in/sites/default/files/PR_No.13of2019.pdf

As per the reports received from 317 operators in the month of April 2019, the number of broadband subscribers increased from 563.31 million at the end of Mar-19 to 571.95 million at the end of Apr-19 with a monthly growth rate of 1.53%. Segment-wise broadband subscribers and their monthly growth rates are as below:

Top five service providers constituted 98.68% market share of the total broadband subscribers at the end of Apr-19. These service providers were Reliance JioInfocomm Ltd (314.81 million), Bharti Airtel (115.71 million), Vodafone Idea (109.66 million), BSNL (22.29 million) and Tata Tele. Group (1.94 million).

3.3 Tele-density

Telephone Density or Teledensity is the number of telephone connections for every hundred individuals living within area. It varies widely across nations and also between urban and rural areas within country. The teledensity has significant correlation with the per capita GDP of the country.

The overall Tele-density in India slightly declined from 90.11 at the end of Mar-19 to 90.05 at the end of Apr19. The Urban Tele-density increased from 159.96 at the end of Mar-19 to 160.13 at the end of Apr-19; however, Rural Tele-density declined from 57.47 at the end of Mar-19 to 57.27 at the end of Apr-19. The share of urban and rural subscribers in total number of telephone subscribers at the end of Apr-19 was 56.67% and 43.33% ,respectively. The overall Tele-density in India had increased from 83.14 at the end of May-16 to 83.20 at the end of Jun- 2016. The Urban Tele-density had increased from 152.34 to 153.22, and Rural Tele-density increased from 51.75 at the end of May-2016 to 51.41 at the end of Jun-2016. The shares of urban subscribers and rural subscribers at the end of Jun-2016 were 57.20% and 42.50%, respectively whereas at the end of Dec 2018 overall Tele-density was recorded as 91.45 % , where urban tele-density was 159.98% and Rural tele-density was 59.50 %.

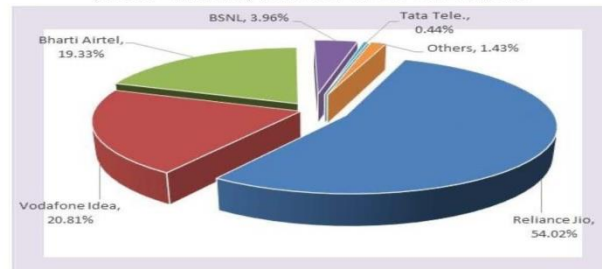**Access Service Provider-wise Market Shares of Wireline Subscribers as on 31st December, 2018**
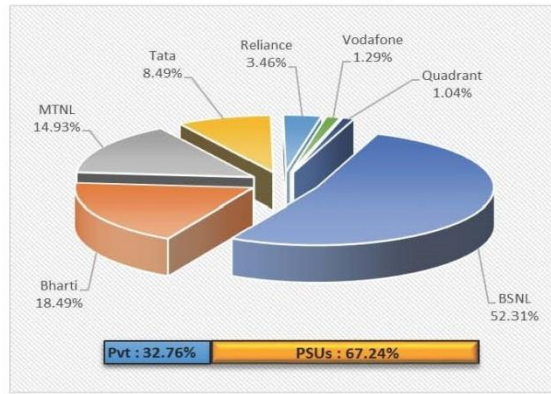
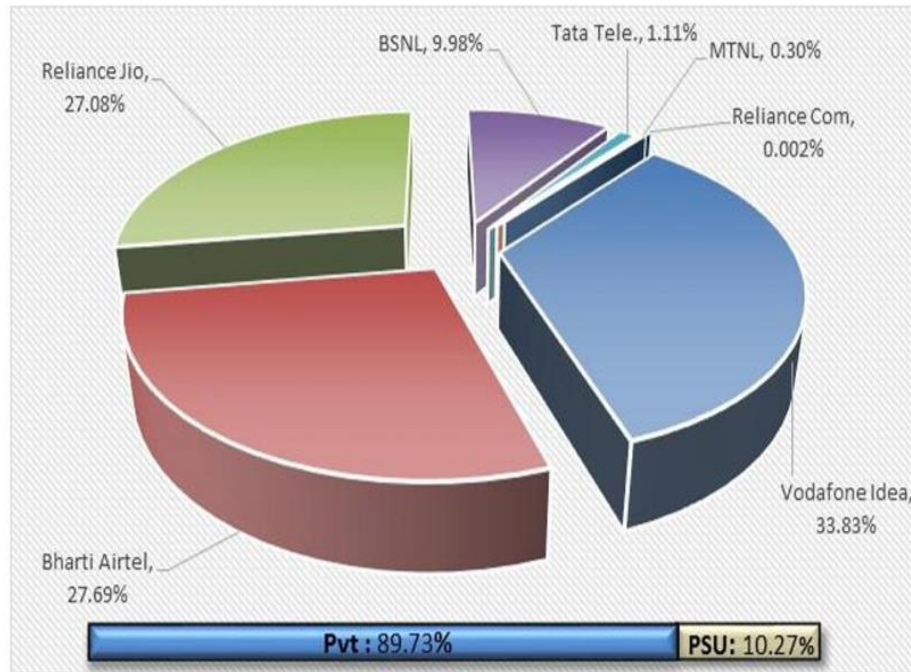**Access Service Provider-wise Net Additions/declines in Wireline Subscribers during the Month of December, 2018**
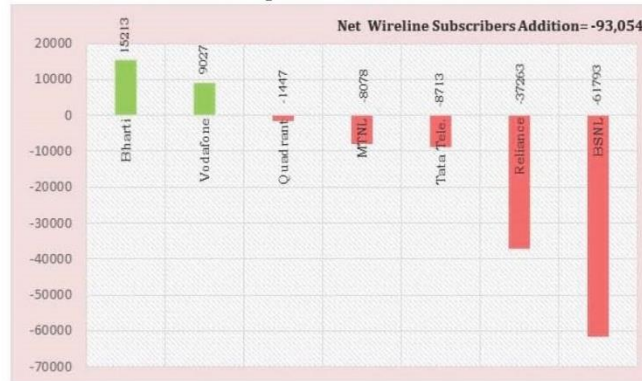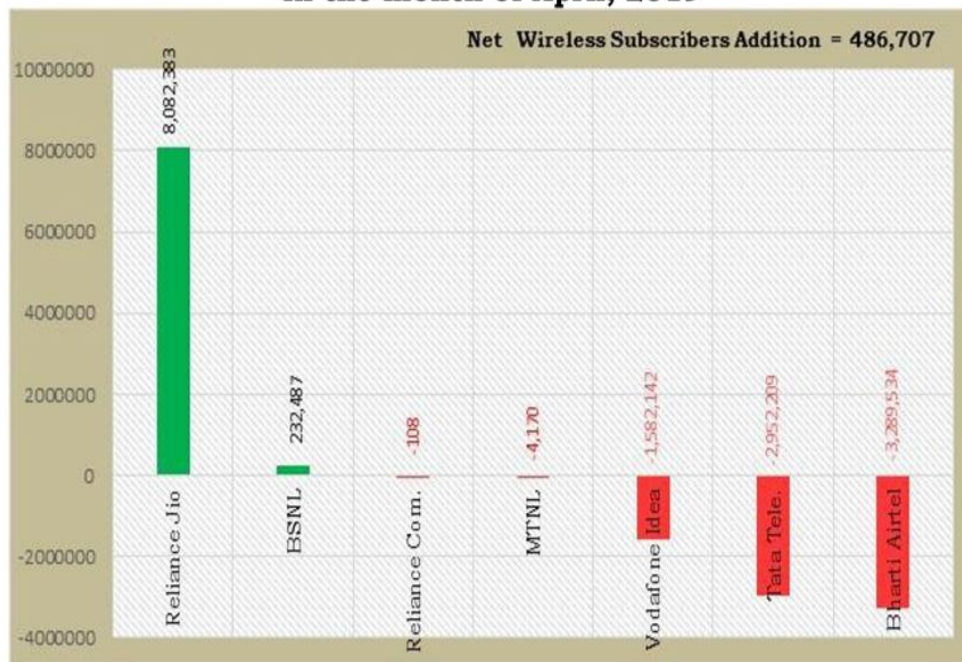

Source: www.trai.gov.in

Service Provider-wise Market Share of Broadband (wired+wireless) Services as on 31.12.2018

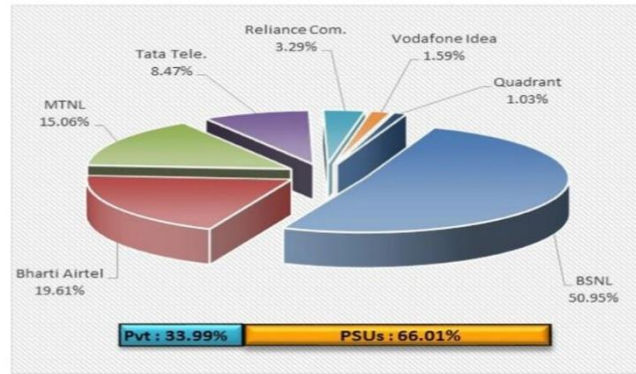## Access Service Provider-wise Market Shares in term of Wireless Subscribers as on 30th April, 2019

Net Additions in Wireless Subscribers of Access Service Providers in the month of April, 2019

:: 1. On noticing that while reporting number of subscribers, some of the TSPs were deducting inactive subscribers. A Direction was issued on 18th August 2017 to TSPs to strictly adhere to the Department of Telecommunications' methodology for reporting their number of subscribers. However, some of the Telecom Service Providers are yet to comply with the Direction.

2. Virtual Network Operator (VNO) of BSNL has started reporting of its subscribers from the month of October, 2018 and the same has been included in the subscriber number of BSNL.
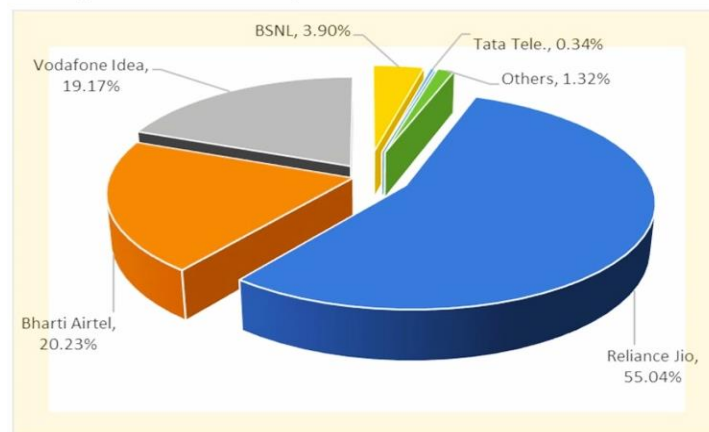
Access Service Provider-wise Market Shares of Wireline Subscribers as on 30th April, 2019

Access Service Provider-wise Net Additions/declines in Wireline Subscribers during the month of April, 2019

Service Provider-wise Market Share of Broadband (wired + wireless) Services as on 30.04.2019

Source: www.trai.gov.in

According to Ahinay, "Globalisation has made telecommunication an integral part of the infrastructure of the Indian economy. India's telecommunication network is the second largest in the world based on the total number of telephone users (both fixed and mobile phone). It has one of the lowest call tariffs in the world enabled by the mega telephone networks and hyper-competition among them. It has the world's third-largest Internet user-base. According to the Internet and Mobile Association of India (IAMAI), the Internet user-base in the country stood at 190 million at the end of June, 2013. Major sectors of the Indian telecommunication industry are telephony, internet and television broadcasting. The greatest technological advancement that we could have possibly got from this is the creation of phone and the Internet. The phone was a major piece of communication, whereby you could instantly communicate with another person that was on the other side of the world. Almost every household now has at least one phone, with most having several"[3].

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[3]Abhinav National Monthly Refereed Journal of Research in *Commerce & Management*
AN OVERVIEW OF INDIAN TELECOM SECTOR Zaraq Zahoor, Abhinav Publication
Volume 4, Issue 3 (March, 2015) Online ISSN-2277-1166.

National Telecom Policy (NTP) of India 2012[4] projected to increase rural tele-density from the current level of around 39 to 70 by the year 2017 and 100 by the year 2020. The number of telephone connections, at the end of February 2012, was 943 million, as compared to 41 million at the end of December 2001. This growth has been fuelled by the cellular segment (mobile phones) which alone accounted for 911 million connections at the end of February 2012. The composition of the telecom sector too has witnessed a structural change, with the private sector accounting for 88 % of the total connections. It is also projected in NTP 2012 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.

As per Ministry of Communication and Technology Report (December 2012) on Implementation of National Optical Fibre Network (NOFN): all village Panchayats are to be connected through NOFN to enable delivery of public and private electronic services to citizens in urban and rural areas. Broadband is a tool for improving the life of people by providing affordable and equitable access to information and knowledge. For individual, broadband has direct impact on their day to day life style and behaviour. For State, it enormously contributes towards trade and generation of employment. Many Information and Communication Technologies (ICT) applications such as e-commerce, e-banking, e-governance, e-education and tele-medicine require high speed Internet connectivity. Government has approved National Optical Fiber Network in October 2011 for providing Broadband connectivity to all Gram Panchayats at a cost of approx 20,000 Crore.

The New Telcom Policy 2018 which has been re-named as 'National Digital Communications Policy, 2018' seeks to unlock the transformative power of digital communications networks - to achieve the goal of digital empowerment and improved well-being of the people of India. In its main objectives it envisages the Broadband for all by 2022 and provide Universal broadband connectivity at 50Mbps to every citizen &**Enable fixed line broadband access to 50% of households in India** & Enable100 Mbps broadband on demand to all key development institutions; including all educational institutions.

The development of the Internet proved to be the major technical driver and significant turning point in telecommunications and it promises great potential for further growth and development in future; expanding so fast and so much further than we would ever imagine. With VoIP growing at tremendous speeds, calls are getting cheaper, and with portable ways to connect to the Internet, it looks as though most of the modes of communication will use the Internet as a connection unit.

We are moving into Next Generation of Data connectivity, where Fiberisation will play a key role. High speed Data has to be supported by backhaul bandwidth which has to be on Optical fiber. India's fifth generation or 5G ambition is set to turn lackluster with mobile infrastructure expansion likely to remain low-paced following policy bottlenecks in the federal governance structure. Fibre-based backhaul is still in infancy in India. Industry's assessment suggests that India's robust 5G network would require 100 million fibre-kilometres (mfkm) optic-fibre cable a year which has been growing at merely a rate of nearly 25 mfkm a year currently .The government has recognized it as the strategic element for a high-speed data network, and has put a huge thrust and aims to increase fibre footprint to fivefold or 7.5 million kilometres by 2022, from the current 1.5 million kilometers. In addition, the national policy aims to fibrise at least 60% of telecom towers by 2022, eventually accelerating migration to 5G.[5]

"Achieving such speeds make fiber connectivity essential. India's high population density also translates into deeper and denser fiber network," rating agency, ICRA, in its finding said, adding that the country has about 500,000 towers of which only 22% are fiberised as against 80% in China.

State-run Bharat Sanchar Nigam Limited (BSNL) that has the largest fibre base of up to 8 lakh kilometresin India is considering to lease out dark fibre to private players in a run up to 5G rollout that according to analysts would help operators cut Capex by leveraging state telco's infrastructure as per need basis. In the new Telecom Policy 2018, Govt has proposed to set up National Fiber Authority. "5G needs fiber highways and tower fibrisation which is essentialfor Roll out of 5G services and the establishment of National Fiber Authority similar to the National Highway Authority or NHAI. These aim towards a significant portion to be invested in fibre roll out"[6]

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[4]TRAI Consultation Paper on Delivering Broadband Quickly: What do we need to do?
http://www.trai.gov.in/WriteReaddata/ConsultationPaper/Document/Consultation%20Paper%20on%20Broadband%2024Sep2014.pdf
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[5]https://telecom.economictimes.indiatimes.com/news/current-telecom-infrastructure-growth-rate-may-play-spoilsport-to-indias-5g-party/69596900

[6]Sterlite Technologies Limited (STL) Group CEO Anand Agarwal

5G will unleash a massive new round of innovation waybeyond what we've seen in wireless to date, spurring incredible economic growth. The power of 5G will impact not just the mobile wireless industry, but will create new opportunities for innovation and sweeping change across sectors like healthcare, manufacturing, technology, agriculture, transportation, hospitality and countless more. It will be another major boost of energy to the technology innovation around the world.5G is going to unlock things that most of us really can't even imagine as on date .It is amazing to know how the life of people will be changing after 5G . Its going to be helpful in almost all infrastructure fieldslike health through Tele-medicines where Patients in rural communities that currently have little to no access to nearby, high-quality medical care and have to travel hundreds of miles just to get a consultation, would have better access to virtual services at their fingertips.

In Education, bylearning in virtual classrooms or studying side-by-side with remote mentors and tutors,.imagine remotely participating in immersive hands-on learning.

In Travel, we shallsoon find **Driverless cars based on 5G** to really kick into action, The first generation of driverless cars will be self-contained, but future generations will interact with other cars and smart roads to improve safety and manage traffic. Basically, everything on the road will be talking to everything else. Machine to Machine communication is going to speed up with launching of 5G Mobiles services

IV. CONCLUSION

The demand for higher speed Broadband is growing all across the world. India is also not behind in the race. There has been decline inWireline broadband customers in India after the launching of 4G wireless services, where people opted or 4G mobile services due to its convenience and speed, and better than being offered by State run Telecom service providers in India. State run PSU i.e. BSNL/MTNL remained major Wireline Broadband provider in the country on conventional twin copper wires along with voice. India had witnessed negative growth of landline broadband in the country after 2016 especially due to launching of 4G mobile services by Reliance jio.

With change of Technologies in Wireline and Wireless, the demand of data has gone enormous across the country and world. People are switching to technologies supportinghigher speed and reliability with minimum latency.

Fiber to Home (FTTH) and 4G Technologies are becoming the better choice of people for catering to their appetite for High Speed Data availability and to meet the basic requirement for the functioning of Internet foreverything and support Smarter Homes and smarter Electronic devices .

Many companies around the world are investing billions of dollarsto develop and prepare for the coming 5G standard. But this is an upgrade that will require a big infrastructure deployment. Or the rollout of 5G services in India, Backhaul and Fiberisationhas tobe improvedsince at present only 22% o towers are connected through fiber optics. It needs to be improved through various measures. New Era of Telecom will witness competition as well as cooperation between various telecom operators where they will be sharing their fibre network with other operators to roll out the 5G services. Fiber will be the backbone for implementation of 5G Technology. BSNL will play the major role by changing its policies. It will then lease out its optical fiber network which is the largest Optical network in India having already laid more than 8 Lac KM of OFC (Optic Fiber Cable). Other operators too will be sharing their OFC network for faster Roll out of 5G services.

It is a few more years wait before 5G becomes widely available to consumers. South Korea has become the first country in the world to launch the 5G services followed by USA in selected trial in a few locations in April 2019.

India is also engaged in dialogue with various companies to procure the 5G Technology as per vision document of Government of India contained in National Digital Communication Policy 2018, which is the new name given to National Telecom Policy-2018.

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