EMPIRICAL STUDY OF TELEPHONE NETWORK AND INTERNET PENETRATION IN INDIA USING DATA ANALYTICS

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Abstract

The present research study highlights the expansion trend and benefits of telephone network (wire line and wireless) and Internet penetration in India w.r.t. ever growing mobile phone subscriber base in the country. Mobile, a luxury item of 1990's, have been transformed into an inseparable part of all strata of Indian citizens. The effective and efficient mobile networks have not only redefined the business processes but have re-shaped and empowered the common masses of India leading to informed and connected society. Endowed with highly regulated telecom sector, India has the highest number of mobile players in service area in each of the country's 22 telecom circles leading to lowest tariff rates in the world.

The paper calls for adopting a multi-dimensional endeavour starting from data collection and its subsequent standardisation, use of analytical tools for its analysis resulting information generation for informed policy decisions. The statistics have been collected from TRAI, Ministry of Statistics & Programme Implementation, Government Data Platform, Department of Telecommunications Government of India and International Telecommunication Union and dealt exhaustively to obtain the following results:

(a) Trend Analysis of Telephone Network (wired and wireless) and subscriber base expansion in India
(b) Measure of Tele density (per 100 inhabitants) in urban and rural India (2008 to 2018)
(c) Growth of Internet Subscriber base in urban and rural India (2015-2018)
(d) Service area wise Internet Subscriptions (millions) (2014-2018)
(e) PSU Telecom Players & Subscriber base in India (in millions) (2008-2018)
(f) Internet Subscribers (per 100 inhabitants) in India and Africa (2012-2016)

Generally, there is expansion in telephone and Internet subscriber base over the last several years in India. The wireless subscriber base is expanding exponentially whereas there is significant decline in the wired line subscriber base in the country.

Further, it is observed that the rate of expansion of telephone and Internet in the States such as Himachal Pradesh, North Easter States and UT of Jammu & Kashmir is quite low due to topographical, hilly terrine and climatic conditions. Inadequate sunlight in these States made the use of solar power ineffective for running a Base Transmission Station.

Lack of proper road connectivity is an issue in most of the North Eastern States of India. Installation of Base Trans-Receiver Station (BTS) for wireless coverage is difficult in hilly landscape of these States. Laying of Optical Fibre Cable (OFC) is not physically and economically viable across the hilly terrain.

Regular cut of underground OFC is more prominent in rural areas and needs to be coordinated with the local authorities regarding digging, repairing followed by road construction as essential part of activities. It is recommended that since the road widening work and frequent landslides lead to fibre cuts, thus, a continued disruption to services.

Strong mandate and harmonization in the activities of local authorities -Rural Panchayat body and multiple entities such as rural electricity, PWD, Gas, Water, and National Optical Fibre Network implementation partners may be ensured for effective and efficient utilization of services and financial resources.

Further, pragmatic land use policy may be formulated for attracting industries in the regions. Micro, small and medium enterprises may be encouraged. Local tourism may be promoted.

To curb costs and focus on core operations, telecom companies have been segregating their tower assets into separate companies, for example, Reliance Communications has decided to finalise a deal to sell its stake in Reliance Infratel. The value of the deal is around US$3.68 billion. Creating separate tower companies has helped telecom companies lower operating cost and improve capital structure; this has also provided an additional revenue stream. To encourage cash economy, Indian government announced to provide free Wi-fi to more than 1,000 gram panchayats.

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The new National Digital Communications Policy 2018, envisaged attracting investments worth US$ 100 billion in the telecommunications sector by 2022 may be executed and operationalized as intended.

Key words: TRAI, BSNL, MTNL

1. Introduction

The present research study highlights the expansion trend and benefits of telephone network (wire line and wireless) and Internet penetration in India w.r.t. ever growing mobile phone subscriber base in the country. India is the world's second largest telecommunications market, with round 1,186.63 million telephone subscriber base at the end of June, 2019 [5]. Mobile, a luxury item of 1990's, have been transformed into an inseparable part of all strata of Indian citizens [3]. The effective and efficient mobile networks have not only redefined the business processes but have re-shaped and empowered the common masses of India leading to informed and connected society [1].
Endowed with highly regulated telecom sector, India has the highest number of mobile players in service area in each of the country's 22 telecom circles leading to lowest tariff rates in the world. According to the 'Household Survey on India's Citizen Environment & Consumer Economy' (ICE 360° survey) conducted in 2016, 88% of households in India have a mobile phone.

India is also the second largest country in terms of internet subscribers. As of 2019, India holds the world's highest data usage per smartphone at an average of 9.9 GB per month. It is expected to double to 18 GB by 2024 [7]. Facebook is the most popular social networking site in the country. There were about 195 million Facebook users in India in 2016, placing India as the country with the largest Facebook user base in the world. Other popular networks include WhatsApp, Google+, and Skype. Retail e-commerce sales in Indian amounted to about 16 billion US dollars that year and are project to surpass 45 billion US dollars in 2021. As per the report of Omidyar Network, mobile phone penetration in India is set to rise to 85-90% by the year 2020 (Live Mint, 2017). By 2021, there will be about 635.8 million internet users in India [6]. The Government has been proactive in its efforts to transform India into a global telecommunication hub. Indian telecom sector's gross revenue grew from US$ 32.05 billion in FY08 to US$ 33.97 billion in FY19. Gross revenue of the telecom sector stood at INR 237,416.6 crore (US$ 33.97 billion) in 2018-19 [8].

Indian telecom sector's revenue is expected to grow by 7 per cent in FY20 backed by stabilizing tariff wars and increased spending by subscribers due to minimum recharge plans The Government of India unveiled the National Digital Communications Policy, 2018 in September 2018. The policy aims to attract US$ 100 billion worth of investments and generate 4 million jobs in the sector by 2022 [8].

The paper calls for adopting a multi-dimensional endeavour starting from data collection and its subsequent standardisation, use of analytical tools for its analysis resulting information generation for informed policy decisions. Statistics have been collected from Telecom Regulatory Authority of India (TRAI), Ministry of Statistics & Programme Implementation, Government Data Platform, Department of Telecommunications Government of India (DoT) and International Telecommunication Union (ITU) [11].

2. Research Objectives

The objectives of selecting this topic and data set for the study is evident as mobile and internet communications are part and parcel of the life of almost all the citizens of India. Under the Digital India Programme of the Government of India, most of the e-services are made available to the citizens through these networks and they are the backbone of the Government's efforts to empower the citizens, a step towards participative and citizen friendly Government.

The main objectives of the study is to analyse the following using IT analytical tools:

(a) Analysis based on Telephone Network (wired and wireless) and subscriber based statistics

i. Trend analysis of Telephone network expansion in India (2014-2018)
ii. Comparative Analysis of wired vs wireless subscribers base (2008 to 2018)
iii. Measure of Tele-density (per 100 inhabitants) in urban and rural India (2008 to 2018)
iv. Population wise Telephone Subscribers (wired and wireless) in various States of India

(b)Analysis based upon Internet subscribers

i. Growth of Internet Subscribers in urban and rural India (2015-2018)
ii. Service area wise Internet Subscriptions (millions)

(c) Analysis based on Telecom Operators statistics

i. PSU Telecom Subscribers in India (in millions) (2008-2018)
ii. Private Telecom Subscribers in India (in millions) (2017-2018)

(d) International comparison

i. Year-wise Mobile Cellular Subscriptions -International Comparisons (2012-2016)
ii. Internet subscriptions (per 100 inhabitants) in India and Africa (2012-2016)

3. Literature Review

3.1 A study by Ms. Seema Grewal in 2012, on the growth of M-Commerce showed that in few years from now the mobile commerce will become more secured as the cell phone companies are spending more to protect their customers and their information from intrusions and hacking. Mobile commerce has gained a huge popularity but still it is in its initial phase and can be further expand to different fields and can play a huge role in effecting human life. Its future seems to be extremely safe and bright and its upgraded version will emerge as the leader in the 4G technological version. Though M-Commerce was a relatively new space then, it goes without saying that the mobile phones have given fillip to e-Commerce (a bigger subset of commerce that contains m-Commerce) (Aggarwal, 2012).

3.2 In a study conducted in West Bengal, IFFCO Kishan Sanchar Limited (IKSL) made an endeavor to disseminate information and knowledge amongst the farmers through voice messaging system in local language. Farmers were mostly benefited from voice mail in adopting better agricultural practices followed by increased production and revenue, change in cropping pattern and connection to market (Goswami, Das, & Basu, 2012).

3.3 In another study Gupta et al investigated the social, technological, economic and political (STEP) factors that have influenced the diffusion process of mobile telephony especially the diffusion speed. The study revealed that competition and government intervention played a significant role in accelerating the diffusion speed of mobile telephony by making the technology affordable. It is found that mobile telephony is a substitute for fixed line telephony in India (Gupta & Jain, 2012).

3.4 In a study conducted in sub-Sharan Africa regarding mobile phone penetration for inclusive human development found that, there are significant synergy effects in political stability, voice and accountability and rule of law thereby implying convergence in inclusive human development (Asongu & Nwachukwu, 2016).

3.5 However, on the contrary, Davey and Davey in a study has raised concerns due to social and psychological effects of excessive use of smartphone's especially among Indian adolescents. They found that smartphone's have made mobile connectivity so accessible that today's Indian generations are abusing their Smartphone. Smartphone abuse to addiction has become more serious since adolescents can download and run numerous applications with smartphone even without Internet connection. They concluded that smartphone addiction is still not sufficiently addressed within studies in literature, so they have suggested more in-depth qualitative and quantitative studies in the future with larger sample sizes, and the development of policies to raise awareness about this issue by Indian governments for better future of Indian adolescents as a priority action (Davey & Davey, 2014).

3.6 Another hazard due to excessive and indiscriminate use of mobile phones has been highlighted in a survey conducted by TNS India Pvt. Limited (Kantar Public India) for Save Life Foundation found that half of the respondents were aware of the implications of mobile phone usage while driving. Further in their study they found that one in five respondents has personally experienced an accident or a near-miss incident when using mobile phone while driving. Around 38% respondents had experienced a near miss accident while using the phone while walking on/crossing the road. Almost one in every four truck/ bus drivers had experienced an accident or near miss when using the phone while driving (SaveLIFE Foundation, 2017).

3.7 Telecommunication by India Brand Equity Foundation highlights the recent trends and strategies in telecom sector. The report deliberates upon the growth drivers and the opportunities in this sector. The industry associations, associated benefits and National Digital Communications Policy – 2018 has been vividly explained.

3.8 There are numerous areas where the literature was lacking. Studies connecting demographics, terrain etc. with subscriber base was not available in open source domains. For example, no studies were found that could discern mobile connectivity and sex of subscribers, an authentic study regarding socio-economic status and its impact on

mobile phone usage to name a few. However, such studies might be undertaken but is not available in public domain for obvious reasons.

4. Research Methodology: [9]

Statistics on Internet Subscriber base of India, State-wise mobile user density and other importance parameters and variables under study have been collected from TRAI, M/o Statistics & Programme Implementation, Government Data Platform of India, Department of Telecommunications, Government of India, International Telecommunication Union. The data thus obtained has been standardised, studied, analysed and the results have been displayed in the form of charts. The trend is represented by a trend line. The quantitative analysis has been exhaustively dealt with in this study.

5. Data Analytics and Observations: [4] [10]

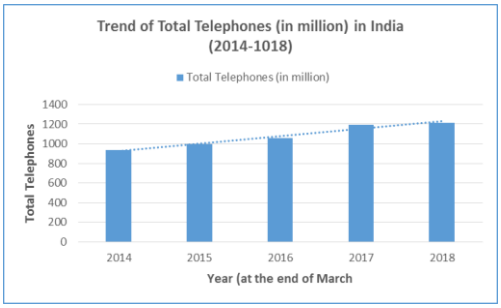
The study and analysis of the data (using analytical software) displays interesting results as discussed below:

5.1 Analysis based on Telephone Network (wired and wireless) and subscriber base statistics

5.1.1 Trend analysis of Telephone network expansion in India (2014-1018)

The data below exhibits the rate of expansion of telephone lines in India in last 5 years. The following is being inferred:

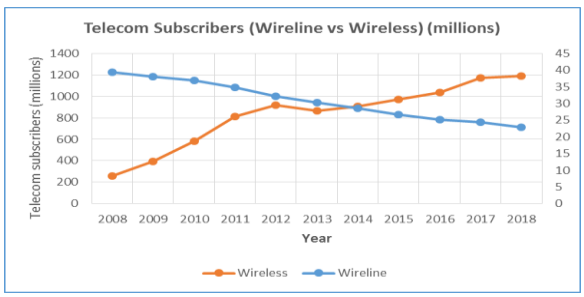
i) There is surge in telephone subscriber's base from the year 2014 till the year 2018 in India.
ii) The trend line depicts rising trend of total telephones (in million) in India during the period of study.
iii) There is steep rise in the total number of telephones during 2014 to 2017, however, a moderate trend line is observed during 2017 to 2018.
iv) The spurt may be attributed to the lowest telephone tariff in India as compared to the world.



5.1.2 Comparative analysis of wired vs wireless subscribers base (2008 to 2018)

The mobile phones have become an integral part of the Indian society leading to a connected society. The chart below shows the decline of fixed lines and growth of wireless phones.

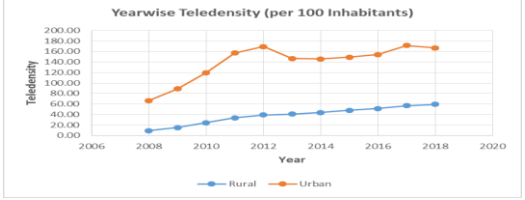
i) The increasing demand for wireless connectivity in India between the years 2004-2013 depicts a steep rise in the wireless users while in the fixed line there has been a fall in the wireline users in India.
ii) It is evident that mobile phone have extensively penetrated into the Indian populace as compared to fixed line phones.
iii) This probably may be due to the fact that the fixed line connections require greater infrastructure and is cost intensive and above all, the possibility of telephone faults are higher and restricts mobility.



5.1.3 Measure of Teledensity (per 100 inhabitants) in urban and rural India 2008 to 2018)

i) It is observed that during the last ten years, there has been steady rise in rural subscribers' teledensity in India, however, there is exponential growth of tele density for urban subscribers till the year 2012.

ii)The teledensity of urban subscribers sharply declined in the year 2013 at 146.64. It slightly picked up in later years at 171.52 in the year 2017 and then declined.

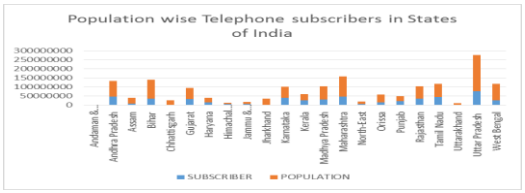


iii) The sudden surge in rural and urban tele density in the year 2016-17 may be due to introduction of free Reliance Jio Services in October 2016.

Phone density can be used to predict the potential market in a particular state for further expansion.

5.1.4 Population wise Telephone subscribers (wired + wireless) in various States of India

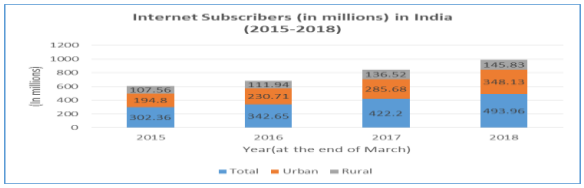
It is observed that the three states, Himachal Pradesh, Kerala and Punjab have more than 70 percent of population with telephone connectivity. However, the States such as Chhattisgarh, Jharkhand and Uttarakhand has the lowest telephone penetration, with less than 20 percent of their population being connected. These states have difficult terrain, undulating ground and some other related issues leading to poor telephone penetration.



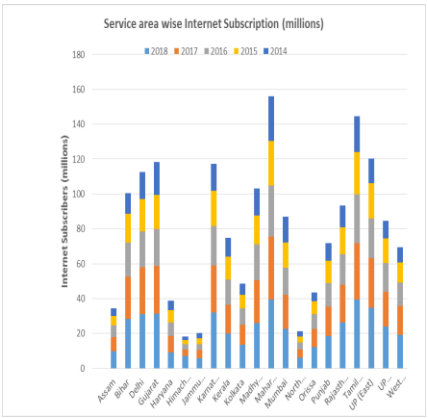
5.2. Analysis based on Internet subscribers statics

5.2.1 Growth of Internet subscribers in urban and rural India (2015-2018)

It is observed that generally the number of Internet subscribers in rural India is low, whereas there is significant rise in the number of Internet subscribers in urban areas. However, the increase in the urban subscribers is relatively low during the year 2015 and 2016. The sudden surge in the Internet Subscribers base in the year 2016 to 2017 may be probably due to launch of free Reliance Jio Services.



5.2.2 Service area wise Internet subscriptions (millions) (2014-2018): It is observed that there is phenomenal growth in the number of internet subscribers in the country over the last five years.



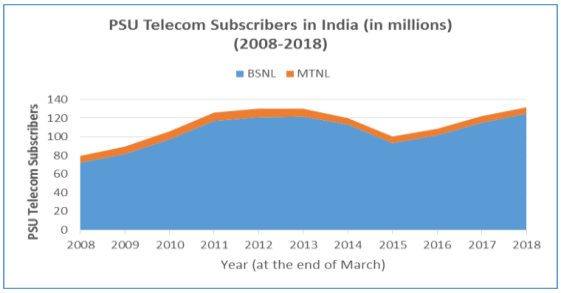
The following is inferred from the chart:

i) The state of Maharashtra has maximum number of Internet Subscribers followed by Tamilnadu and Uttar Pradesh (E).
ii) The state of Himachal Pradesh has lowest Internet subscriber base due to its topographical location, difficult terrains, hills and unpredicted weather conditions.
iii) The Union Territory of Jammu & Kashmir and the North Eastern states of India lacks proper road connectivity due to hilly landscape. Installation of Base Trans-Receiver Station (BTS) for wireless coverage is difficult and laying of Optical Fibre Cable (OFC) is not physically and economically viable across the hilly terrain of North Eastern States.

5.3 Analysis based on Telecom Operator wise statistics

5.3.1 PSU Telecom Players & Subscriber base in India (in millions) (2008-2018)

There are public as well as private telecom operators in India. Bharat Sanchar Nigam Ltd., (BSNL) and Mahanagar Telephone Nigam Ltd (MTNL) are the main public telecom operators whereas there are three major private players — Bharti Airtel, Reliance Jio and Vodafone Idea.



The following is inferred:

i) BSNL has larger subscriber base as compared to MTNL. However, MTNL's Internet subscriber base has drastically decreased over the last ten years.
ii) The Internet subscriber base of BSNL generally exhibits fall of its subscriber base over the last ten years.

5.3.2 Private Telecom Players in India (2017-2018)

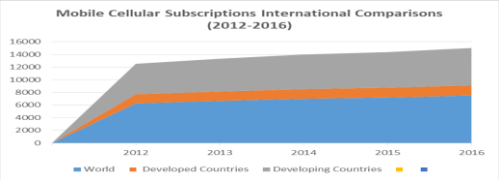
Bharti was the largest Internet Private telecom provider followed by Vodafone, however, in August, 2018 merger of Idea and Vodafone took place. Currently, the Indian telecom sector has three major private players — Bharti Airtel, Reliance Jio and Vodafone Idea.

5.4 International Comparison [2] [9]

5.4.1 Year-wise Mobile Cellular subscriptions -International Comparisons (2012-2016)

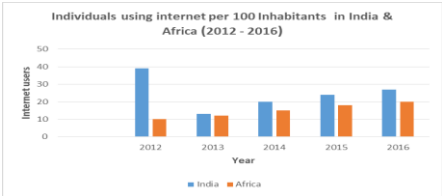
The chart based on the mobile cellular subscription in the world, developed and developing countries depicts the factual and practical results.

The mobile subscription for developing countries covers larger area of the graph as that of the developed countries as the population density is usually high in developing countries.



5.4.2 Internet Subscribers (per 100 inhabitants) in India and Africa (2012-2016)

It is observed that in the year 2012, India's Internet subscriber base was almost four times as that of the Internet subscribers' base of Africa. In the year 2013, Internet subscribers in Africa increased significantly and became comparative to India. However, in later years this variable (number of Individuals using the Internet per 100 inhabitants) increased significantly for India to attain 27 in the year 2016 as compared to the value 20 for Africa.



6. Conclusion:

Generally there is expansion in telephone and Internet subscriber base over the last several years in India. The wireless subscriber base is expanding exponentially whereas there is significant decline in the wired line subscriber base in the country. Further, it is observed that the rate of expansion of telephone and Internet in the States such as Himachal Pradesh, North Easter States and UT of Jammu & Kashmir is quite low due to topographical, hilly terrine and climatic conditions. Inadequate sunlight in these States hamper the effective use of solar power Base Transmission Stations.

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To curb costs and focus on core operations, telecom companies have been segregating their tower assets into separate companies. For example: Reliance Communications has decided to finalise a deal to sell its stake in Reliance Infratel. The value of the deal is around US$3.68 billion. Creating separate tower companies has helped telecom companies lower operating cost and improve capital structure; this has also provided an additional revenue stream. To encourage cash economy, Indian government announced to provide free Wi-fi to more than 1,000 gram panchayats [4] [10].

7. Recommendations: [13]

Road widening work and frequent landslides lead to fibre cuts, thus, a continued disruption to services. Regular cut of underground OFC is more prominent in rural areas and needs to be coordinated with the local authorities regarding digging, repairing followed by road construction as essential part of activities.

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Further, pragmatic land use policy may be formulated for attracting industries in the regions. Micro, small and medium enterprises may be encouraged. Local tourism may be promoted.

The Government of India's announcement regarding Phased Manufacturing Programme (PMP) to promote domestic production of mobile handsets, should be executed as per vision for building a robust indigenous mobile manufacturing ecosystem in India.

The new National Digital Communications Policy 2018, envisaged attracting investments worth US$ 100 billion in the telecommunications sector by 2022 should be executed and operationalized as intended.

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