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A Study on Suitability of Universal Service Obligation Wi-Fi Hotspots Scheme for Reducing Digital Divide

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Abstract
There is a paradigm shift in the Telecom services world over and no exemption in India too. The telecom sector had been transformed from traditional landline services to broadband, Wi-Fi and subsequently to mobile internet facilities. Overall the focus had been shifted from basic services to the data services. In order to understand this there is a need to study the requirement of Internet and data services in India and provision of these facilities to rural and remote areas on subsidy through Universal Service scheme by Government of India. This paper first aimed at showing the trends in the telecom and internet services in India, secondly to give a brief picture about various Wi-Fi Hotspot schemes through Universal Service Obligation (USO) fund. Finally the gaps between rural and urban areas have been explained and also the future requirements were forecasted.
Key words: Universal Service, Basic Service, Universal Service Obligation, data services, Wi-Fi Hotspots.

1. INTRODUCTION

"World Summit for Social Development (WSSD, Copenhagen, 1995) recognized that the new information technologies and new approaches to access to and use of technologies by people living in poverty can help in fulfilling social development goals."

Initially the communication services like Posts and Telegraphs were known as Universal services, later on the Telecommunication and Data Services were brought to the umbrella of the Universal Services (James,Campbell, 2008) in his book Universal Service Obligation: History and Development of Laws Relating to Provision of Universal Postal Services). The concept of Universal service was originated by Rowland Hill and the Uniform Penny Post during the year 1837 in United Kingdom for provision of uniformed postal services across the nation. However, the term "Universal Services" was coined by Theodore Newton Vail President of American Telegraphs and Telecommunications, Bell Laboratories (AT&T) during the year 1907 (Krishna P J, 2004) Universal service: beyond established practice to possibility space.)

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The concept of Universal service in India was taken birth as part of new telecom policy 1999 (NTP 99) with an aim (a) To provide quality services which are nondiscriminatory and affordable to all people in rural and remote areas; (b) To provide effective linkage of rural and remote areas with main land; (c) Provide the services in an economically effective manner. (d) To pave the way to reap the benefits of inclusive growth to unconnected areas.
The wireline connections have declined from 40.22 Million on March 2006 to 21.70 Million by March 2019 where as the Wireless connections have increased from 101.87 Million to 1161.71 Million during the same period. This shows how the data requirements have increased over a period of time and how the access services are being dominant over the basic services. In the urban and rural areas number of telephone connections have been increased from 123.55, 18.54 to 669.14, 514.27 respectively. However as per 2011 census 65% of the Indian population is living in rural and the remaining 35% are living in urban areas. The rural teledensity as on March 2019 it is 57.50 and in the Urban it is 159.66 per 100 inhabitants. This gives a clear picture on the urban and rural divide in the telecom sector[As per the telecom statistics in India published by Department of Telecommunications and the TRAI on 27 Dec 2019].
As part of the digital India mission initiative in the recent past the online services sector like e-governance, e-marketing, other digitally enabled transactions and digital payments have been increased drastically due to which the utilization of data services have been increased over traditional basic land line telephonic services. In view of this the provision of data services to every rural and remote area become obligation to the government to bring the socially and economically disadvantageous sector to the mainstream to connect with the outside world. These services are also handy during natural calamities and other serious problems in these areas.

Table 1: Total Internet Connections - Rural & Urban (Millions) (2014-2019)

Year	Rural	Urban	Total
2014	-	-	251.58
2015	107.56	194.77	302.33
2016	111.95	230.71	342.66
2017	136.52	285.68	422.19
2018	145.83	348.13	493.96
2019	227.01	409.72	636.73

(Source: Department of Telecom Statistics for the year 2019 published on 27 Dec 2019.)

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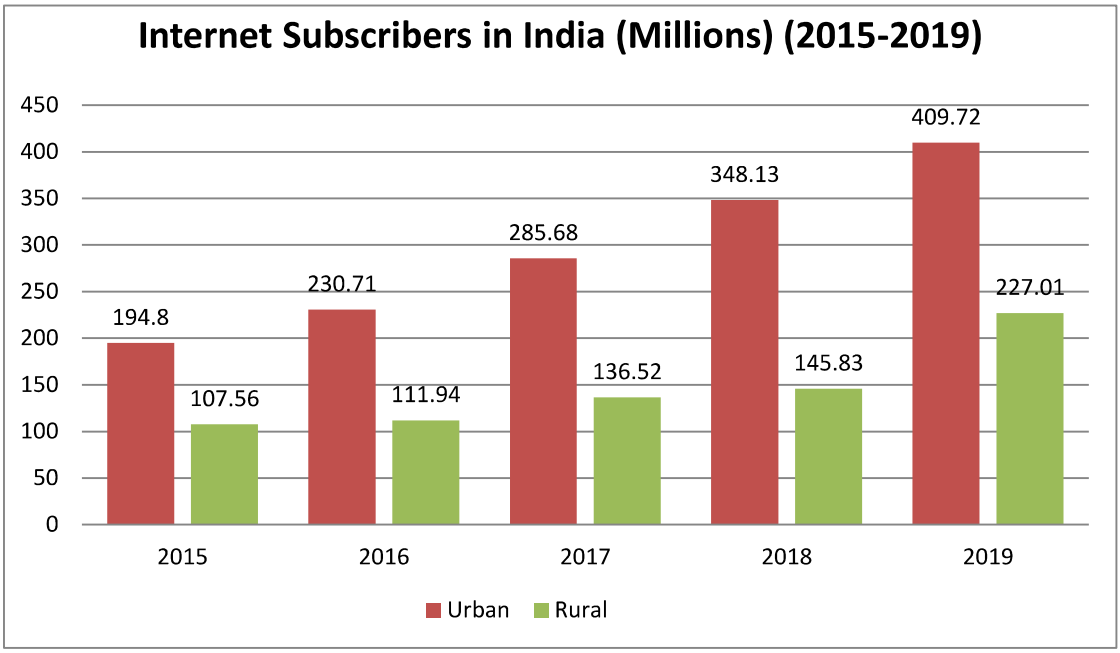
Figure1: Internet Subscribers in India



The Figure 1 and Table 1 shows the number of Internet subscribers in urban and rural area wise and there is a huge variation in the subscribers between two regions and this indicates there is a digital divide between urban and rural areas.

Table2: Internet Subscribers in India(Per 100 Inhabitants)

Year	Total	Urban	Rural
2013	13.45	-	-
2014	20.29	-	-
2015	24.09	49.07	12.89
2016	26.98	58.28	12.8
2017	32.86	70.83	15.49
2018	38.02	84.74	16.41
2019	48.48	97.94	25.36

(Source: Department of Telecom Statistics for the year 2019 published on 27 Dec 2019.)

The number of internet subscribers for 100 inhabitants of rural and urban population indicates the density of population preferring the internet subscription from till 2019 where the urban is dominant over rural.

1.1. Various Wi-Fi schemes under USO

1.1.1. About Wi-Fi Hotspots in BSNL Exchanges

The main aim of the scheme is to set up 25,000 public Wi-fi hotspots at rural telephone exchanges of BSNL. The Universal Service Provider (BSNL) provides broadband internet access over Wi-Fi leveraging BSNL backhaul. The smart phones, tablets, etc would be target end-user devices. The Universal Service Obligation Fund (USOF) shall provide financial support as per the Financial Conditions of the Agreement.

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1.1.2. CSC Wi-Fi Choupal:

The main motive of the scheme is to provide connectivity to the last mile by using the Bharat Net infrastructure for provision of broadband services in Panchayats and other rural areas. The Universal Service Provider has to set up Wi-Fi Choupal in 5000 Gram Panchayats (GP) by using the end points of Bharat Net Optical Fiber for provision of Wi-Fi network to nearby villages. This project aims to expand the coverage zone of Wi-Fi network in GPs and villages in order to cover inhabited areas of the rural areas. The target end-user devices are mobile phones and tabs. The power for running the Wi-Fi and associated equipment has to be drawn from solar power supply. The model's efficiency and effectiveness test would provide inputs for other service providers to enter into rural markets for development of their own models for to provide services in rural areas.

As per the Financial Conditions of the agreement the USO Fund will provide financial support. The CSC e Governance Services India Limited will own the infrastructure created under this project. (Source: http://www.usof.gov.in/usof-cms/csc-Wi-Fi-choupal.jsp)

1.1.3. Pilot Wi-Fi Hotspots by Rail Tel:

The objective of the project is to provide the Wi-Fi hotspots at rural Railway Stations of 200 villages. Broadband internet access over Wi-Fi by using its own backhaul has to be provided by the Universal Service Provider. This facility must be provided to the tablets, through kiosks and smart phones. This pilot project aims to test the strength, practicability and commercial viability of the model being deployed by universal service provider.

The Wi-Fi services through USOF scheme are being provided to rural and remote inhabitant areas in different approaches one is at the telephone exchanges located in villages, in the second scheme it is directly at the village panchayats (choupal) where the usual gatherings at village level takes place and in the third scheme the rural railway stations at inhabitant areas were identified to launch the scheme. The salient features of the above schemes are to provide access points to deliver the net connectivity for free of cost for first half an hour per day and a download limit of 4GB per month. In case the public want to access more than that, they have to pay nominal cost for uninterrupted access. Many of the sites located in the rural and remote inhabitant places, where the public need the internet services in affordable range. The schemes are being promoted by way of display boards indicating the features of the scheme.

The department of telecommunications through its field units conducting inspections to check the functioning of the sites and to know whether the public residing around the site is aware and the facility is being utilized properly, subsequently the funds through USOF is being released.

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Table 3:Service area wise Wireless internet subscriptions (Millions)

Service Area	2019		2018		2017		2016		2015	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Andhra	19.78	27.04	12.67	22.6	11.93	17.56	8.95	13.77	7.93	12.13
Assam	5.67	5.76	5.03	4.68	4.24	3.72	3.21	3.44	3.24	2.13
Bihar	22.6	16.46	13.49	14.64	11.89	11.92	8.85	10.49	7.92	8.38
Delhi	0.69	33.32	0.72	28.67	0.69	24.41	0.94	18.21	1.02	16.26
Gujarat	11.23	27.39	8.06	21.87	8.05	17.75	5.87	13.88	6.35	11.97
Haryana	5.5	8.95	3.75	4.83	3.59	5.58	2.92	4.19	3.1	3.6
Himachal	3.19	1.87	2.02	4.8	2.08	1.56	1.74	1.18	1.62	0.86
Jammu	2.56	3.93	1.9	3.79	1.86	2.54	1.83	1.7	1.79	1.47
Karnataka	11.83	26.54	6.59	23.57	6.26	18.64	5.43	15.35	5.2	13.16
Kerala	9.47	13.49	6.92	11.16	6.13	8.69	5.01	7.92	5.39	5.98
Kolkata	1.53	13.18	1	11.4	0.76	9.93	0.55	7.83	0.44	6.74
Madhya	15.65	24.71	6.9	17.98	7.65	16.07	6.21	13.21	5.66	9.96
Maharashtra	20.04	31.57	12.6	25.07	11.6	22.53	9.61	18.14	9.05	14.91
Mumbai	1.21	24.38	0.72	20.54	0.5	17.74	0.28	13.98	0.25	12.97
North	2.76	3.8	2.36	3.45	2.2	2.41	1.95	1.98	1.89	1.53
Orissa	9.61	5.94	5.63	6.25	4.89	5.3	3.33	4.64	3.49	3.51
Punjab	6.99	15.55	4.44	13.15	4.53	10.97	4.56	7.77	4.68	7.18
Rajasthan	15.53	19.71	9.43	16.3	8.66	12.1	6.96	9.53	7.26	7.77
Tamil	11.19	31.88	9.14	28.05	7.89	22.01	6.67	19.06	6.32	15.62
UP(East)	22.77	21.69	14.42	19.84	13.37	14.73	11.18	10.82	10.61	9.3
UP(West)	11.89	19.65	7.02	16.24	7.08	12.32	6.46	9.55	5.65	7.93
West Bengal	13.43	13.12	9.07	9.97	8.73	7.56	7.59	5.49	6.86	4.15
Total	225.12	389.93	143.9	328.8	134.6	266	110.1	212.1	105.8	177.5

(Source: Department of Telecom Statistics for the year 2019 published on 27 Dec 2019.)

Figure2: Wireless internet subscriptions (Millions)

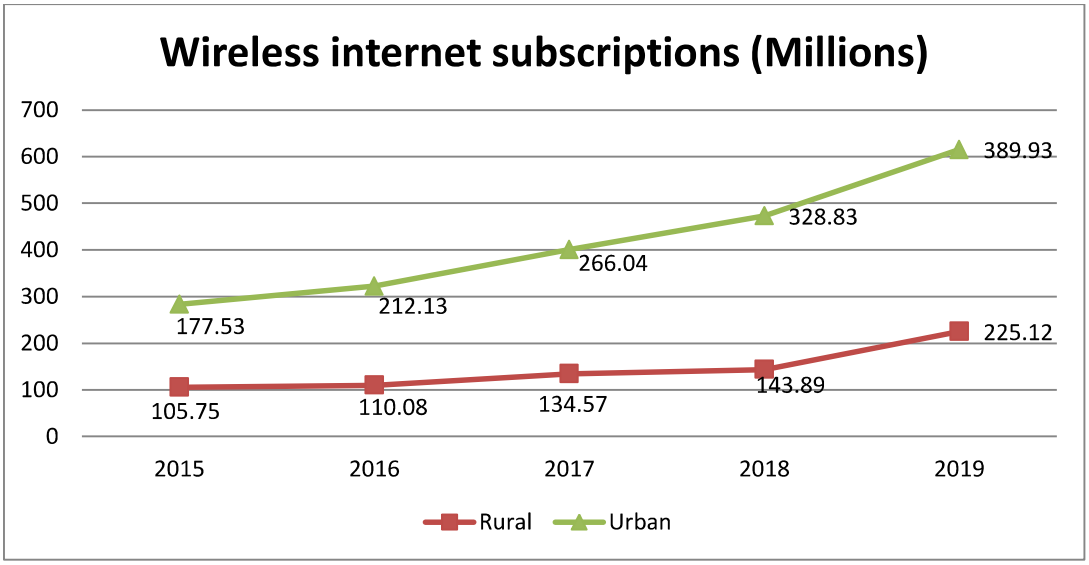

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Figure 2 explains the wireless internet subscriptions in Million pertaining to rural and urban regions. The subscriptions are increased from 105.75 million in 2015 to 225.12 in the year 2019 which is about 2.13 times increase whereas during the period wireless subscriptions in urban region has jumped from 117.53 to 389.93 million and the increase is 2.2 times.

2. REVIEW OF LITERATURE

The following review-based data were collected from various yet valid secondary sources such as Scopus, web-of-science, etc. Sufficient care had been taken to keep these reviews directly connected to the aims of the study. There are 20 reviews related to variegated issues such as gender usage differences, efficacy of technology, equitable access, users experience on technology, technology integration, comparisons among technologies, factors of usage, broadband connectivity options, etc.

Mudliar P., (2018) has done certain study with a title "Public Wi-Fi is for Men and Mobile Internet is for Women: Interrogating Politics of Space and Gender around Wi-Fi Hotspots". This study explains how the women will face the exclusions in internet access and use due to the prevailed social norms that restriction of their movements and restrict them to use the data on mobiles, when comparing with men the Internet usage of women is very limited, whose relatively free mobility permits them to access and use of the free Wi-Fi in the community. The author's interviews with a commercial Wi-Fi provider reveals, poor assumptions about women's Internet habits and gendered mobilities influencing access. The outcome of the study reveals that though they are able and desire to pay for Wi-Fi access, the presence of women in using of these services is almost negligible.

Kranz M., (2010) did certain study with an aim to discuss Digital Enhanced Cordless Telecommunications (DECT) and its potential for positioning and localization. Though the technology is not new, and the application of DECT for localization has so far not been thoroughly investigated, for its usage in outdoor and indoor. Large data pertaining to DECT and Wireless Local Area Networks (WLAN) had been analyzed in urban, rural and sub urban areas and the study reveals that the DECT may improve the accuracy and viability when comparing with the WLAN and GSM schemes.

Mark A.G., (2015) The Rationale for Universal Access to Digital Services in which presented the current scenario and also identified the necessary research requirements to switchover to universal access regime from existing universal service regime, for provisioning reasonable access of digital services to all on an equitable basis whether their live in federal, state and local governments jurisdiction.

Jon C.A., *et al* (2012) in their paper on PAWNS; the study made some suggestions to divert the unused capacity of home-based broadband networks to other users in the Public Access Wi-Fi Service by using certain techniques, and also explained how these can be deployed from urban to rural communities. In this regard a longitudinal multi method assessment of participants conducted to understand the current scenario and their experiences of the new technology. The study suggested for installation of these techniques throughout the nation in favor of new government policy to encourage the telecom industry.

William L., McKnight L. W., (2003) A comparison had been made between third generation wireless internet access with Wi-Fi and also Wire-line local area network with IMT-2000 embodied 3G. It has aimed at explaining further areas of research required for the betterment of internet services. The questions to be put for integration of 3G technology and

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Wi-Fi networks and how to bill and what kind of infrastructure needed to convert the Wi-Fi as wide area service provider platform along with the new business model and the technology changes required to expand the Wireless technology in rapid pace.

Bhaskar R., (2007) did certain study and his paper aims at comparing various wireless technologies that are available in providing the broad band services in rural India and suggested the requirement of more planning and utmost care to be taken while deploying these technologies. The cost for provision of services to be controlled judiciously by making choices of towers at service provider's end and poles at subscriber's place by not compromising the coverage issues. The conclusive remarks of the paper stressed on the provision of network connectivity at the rate of 256 kbps at each village with the help of kiosks with less costs.

Mingliu Z., Richard S. W.,(2003) studied about digital divide. The study focused on realistic demographics, operational costs and the revenue from operations, the broadband usage, demand and the return on investment in providing the broadband wireless access in rural and remote areas. The outcome of the study indicates that though existing mesh and multiple hop routing providing the services in rural and remote areas, more exploration is required in the areas in 802.11b and 802.11a technologies at 2.4 and 5 GHz respectively which are available now.

Josh W.,*et al*(2016) in their paper studied abut pathway to ubiquitous broadband. He has considered few constructs such as environments, policies, and technologies for implementation in his paper. This paper, the author seeks to identify what is to be achieved, the environment in which it needs to be achieved, the pertinent policies and policy decisions, the potential technologies that can be used for implementation, and how to make a solution that is beneficial to the members of the community and to the corporate partners that implement this broadband network. In this era of high technology, it is important for all stakeholders of high speed broadband technology to act in unison and build our proposed framework that would be cost efficient and have the maximum reach of technology. This would also help improve the human development of local communities and aid in the betterment of their lives and of our society.

Catherine A. M., Amelia B.,(2011) in their paper titled "An Exploration of User-Generated Wireless Broadband Infrastructures in Digital Cities" which examines the broadband connectivity options available in digital cities. It explains various services provided by the commercial operators, public sector and the citizens themselves and suggested an hybrid approach for the development of broadband with the help of developing the wireless, fiber networks in a platform for provision of infrastructure. Further study in this area is required to understand the future requirements of digital cities.

Craig D., *et al*(2006) in their paper on Municipal Broadband studied about various challenges and perspectives, the challenges of municipal broadband had been reviewed and recommended the deployment of good broadband services. The outcome of the study is irrespective of business model there needs to be a national policy on municipal broadband to promote a viable and reasonable broadband for United States.

Lisa F. S., Mogen N.,(2013) wrote a paper titled "The usage and Impact of Broad band: A South African Household analysis" studied the impact of broad band services in South African households, has identified that there are huge number of people especially in the rural

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segment of South Africa of varied income and educational background have access to mobile broadband data services. The reason is high mobile phone penetration rate in the country and suggested the requirement of future research to investigate more mobile broadband data services in more rural parts of South Africa.

Hannibal T.,(2006) in the paper WI-FI Everywhere: Universal Broadband Access as Antitrust and Telecommunications Policy. The thesis suggests that there needs an encouragement from states and Congress for provision of free and low-costWi-Fi broadband to the citizens. It also highlighted the protection of public interests needs to be taken care by the private industry. It also stressed the role of Congress in lifting the barriers by doing proper legislation for sustainment of open and competitive environment for urban broadband and Wi-Fi networks and ensure minimum intervention of judicial system in such legislations.

Subash B.,(2000) in the paper titled "Social Implications of Information and Communication Technology in Developing Countries" studied various lessons from Asian Success Stories. It highlighted the successful stories of various types of applications and discussed various applications in detail to promote internet communication technology for the development of rural areas. The hindrance is due to lack of participation by the poor in governance hence, there needs a greater sharing of information among major stakeholders will improve the ICT in these countries.

Amos N., BjornP., (2010) did certain study on sustainable broadband communication. The study enunciated the validity of the approach on community networking pilot project of Tanzania based on affordable high-performance, low effective technologies in rural areas and suggested a well-established high performance and cost-effective model for provision of internet services in rural and remote areas of country.

Andrea H. T., Alison P., Julio A. O., (2014) studied about the reforming policy to promote local broadband networks. It suggested the requirement of hybrid public broad band and highlighted the requirement of networking facilities in the development of science and technology and development and needs a systematic approach of Government policy for funding and developing municipal networks.

Rekha J., Raghuram, G. (2009) did study on Indian experience of improving rural tele density. The study has highlighted role of Universal Service Obligation Fund (USOF) in rural telecom services. The recent policy initiatives to create the USOF to support various initiatives like provision of mobile services for improving teledensity. However, these initiatives have little impact but the policy decisions of the Government to provide the cost-effective services by implementing the revenue sharing and access deficit charges (ADC) and the raise of Private participation in the sector penetrates the telecommunication facilities in rural and remote areas in India and subsequently the teledensity had been suited up rapidly.

John M. C., William H. L., (2011) in the paper Mobile Broadband Growth, Spectrum Scarcity and Sustainable Competition, studied the scenario where the spectrum is scarce and its impact on sustainability of provision of broadband facility over mobile phones and recommended the usage of antenna architecture, Wi-Fi and suggested the other related ways to be integrated to develop new models in supporting the internet services in competitive environment.

Payal M., (2007) had studied about issues of design and implementation in his paper titled "India's Universal Service Obligation for Rural Telecommunications". He explains issues of design and

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implementation, critically analyzed the design and implementation of the subsidy mechanism for the expansion of rural telephony in India. The focus of the paper is the Indian Universal Service Obligation (USO) for telecom. We present the anomalies of the USO regulatory and policy regime since its inception in 2002 and discuss the subsequent Telecom Regulatory Authority's (TRAI) proposals to ameliorate these flaws. It is important to debate (1) whether the USO scheme created the least possible distortion to an otherwise well-functioning market, and (2) whether it provided a level playing field for operators bidding in an auction to receive the USO subsidy. This is a major consideration in evaluating a subsidy mechanism, as the Indian economy is replete with examples of misdirected and market distortion subsidies Given development linkages of Information Communication Technology (ICT), India cannot afford to repeat these mistakes.

Subhash B., (2000) in the paper "Enhancing Telecom Access in Rural India" explained few options and presented status of Information and Communication Technology (ICT) in rural India in terms of access to telephony, Internet and other electronic media. The study proposed the need of a micro level analysis in rural areas and the requirement of more investments in this area to improve the coverage in rural areas and highlighted the need in grading the areas basing on their economic activities. The requirement of rapid development of rural infrastructure developed also explained in the study. The raise of ICT facilities will further lead to development of these rural areas. The conclusive remarks are to understand how to spread the information culture in rural areas.

Milton M., (1997) studied that, united states and other countries' exercises have not been very creative in making their universal service policies. The findings include that the infrastructure of telecommunication increasing rapidly and expanding at an outstanding rate. Next, the rental price is not a factor affecting the affordability of service. Further, the most important future concern is how people will access and use infrastructures surround them. And there should be account relationship between supplier and user to gaining the access communication facilities when and where they are needed. It explores some of the issues of convergence of card-based commerce and telecommunications access.

2.1. Summary on review of literature

Muralidhar P., (2018) finds that the women face social exclusions for using Wi-Fi in spite of their willingness and ability to pay for it. Kranz, M., (2010) studied accessibility and validity of technology and its efficacy for usage or consumption. Mark A. G., (2015) studied access of digital services to all on an equitable basis. Jon Crowcroft et al, studied users understanding on the current scenario and their experiences of the new technology. William L., et al, (2012) studied integration of 3G technology with Wi-Fi and new business model and the technology changes required to expand the Wireless technology in rapid pace. Bhaskar R., (2007) compared various wireless technologies that are available in providing the broad band services in rural India. Mingliu Z., Richard S. W., (2003) studied various factors such as demographics, operational costs, revenue from operations, broadband usage, demand, and return on investment in providing the broadband wireless access in rural and remote areas. Josh W., et al (2016), studied environments, policies, and technologies and targets for usage achievements. Catherine A. (2011) studied broadband connectivity options. Craig Dingwall, (2006) studied challenges and perspectives for local authorities to implement schemes and ensure required usage.Lisa F. S., Mogen N., (2013) studied about impact of broad band services in South African households' lifestyle. Hannibal T., (2006) studiedabout public private participation in Wi-Fi industry.Subash B., (2000) studied about Wi-Fi applications in detail to promote internet communication technology for the development of rural areas. Amos N., Bjorn P(2010) studied validity of the approach on community networking pilot project of Tanzania. Andrea H. T., *et al*(2014) studied reforming policy to promote local broadband networks. Rekha J., Raghuram, G. (2009) studied role of Universal Service Obligation Fund (USOF) also about policy initiatives to create the USOF to support various initiatives like provision of mobile services for improving tele

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density. John M. C., William H. L., (2011) studied scarcity of spectrum and its impact on sustainability of provision of broadband facility over mobile phones. Payal M., (2007) did a study on issues of design and implementation, critically analyzed the design and implementation of the subsidy mechanism for the expansion of rural telephony in India. Subhash B., (2000) studied about status of Information and Communication Technology (ICT) in rural India in terms of access to telephony, Internet and other electronic media. Milton M., (1997) had studied creativity in making universal service policies effective in US.

Table 4: Summary to review of literature

Authors	Year	Research Issue
Muralidhar P.	2018	social exclusions faced by women for using Wi-Fi
Josh W., et al	2016	environments, policies, and technologies and targets for usage achievements.
Mark A. G.	2015	access of digital services to all on an equitable basis
Andrea H. T., et al	2014	reforming policy to promote local broadband networks
Lisa F S and Mogen N	2013	impact of broad band services in South African households' lifestyle.
Jon C., et al,	2012	users understanding on the current scenario and their experiences of the new technology
William L, et al,	2012	integration of 3G technology with Wi-Fi and new business model and the technology
Catherine A.	2011	broadband connectivity options
John M. C., William H. L.	2011	scarcity of spectrum and its impact on sustainability Wi-Fi practices
Kranz, M.	2010	accessibility and validity of technology and its efficacy for usage or consumption
Amos N., Bjorn P.	2010	validity of the approach on community networking pilot project of Tanzania.
Rekha J., Raghuram, G.	2009	role of Universal Service Obligation Fund (USOF) also about policy initiatives
Bhaskar R.	2007	compared various wireless technologies that are available in providing the broad band services in rural India
Payal M.	2007	design and implementation, critically analysed the design and implementation of the subsidy mechanism for the expansion of rural telephony in India
Craig D.	2006	challenges and perspectives for local authorities to implement schemes and ensure required usage
Hannibal T.	2006	public private participation in Wi-Fi industry
Mingliu Z., Richard S. W.	2003	factors such as demographics, operational costs, revenue from operations, broadband usage, demand, and return on investment in providing the broadband wireless access in rural and remote areas.
Subash B.	2000	Wi-Fi applications in detail to promote internet communication technology
Subhash B.	2000	status of Information and Communication Technology (ICT) in rural India
Milton M.	1997	creativity in making universal service policies effective in US

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3. RESEARCH GAP AND NEED FOR THE STUDY

From the studies it is observed that the most of the literature found to emphasize few issues related to policy, impact of socioeconomic characteristics such as gender on Wi-Fi usage, digital enhance thorough cordless technology DIECT, the rationale for Universal Access to Digital Services, working of Public Access Wi-Fi Services, technology comparison of 3G Vs. Wi-Fi. Few papers also found to address issues related to digital divide, ubiquitous broadband through environments, policies, and technologies to implementation. There are a couple of studies that found to have done comparisons for broadband and Wi-Fi. The usage and impact of broadband, India's Universal Service Obligation (USO) in rural areas were also studied and policy approach that favors hybrid public broadband was examined. However, the issue regarding digital divide between urban vs rural is still not sufficiently addressed. Few reasons being: most of the studies did discuss about digital divided in general and not with reference to Universal Service Schemes in fulfilling the divide. The role of USP in fulfilling the digital divide between urban vs rural on data access is not clear. The other important issue that about factors impacting the divide between Wi-Fi and wired is still an unaddressed gap in the body of knowledge.

3.1. Research methods

This research is primarily an exploratory study. The data is being collected from certain valid yet official resources such as USO inspection data from USOF website and other secondary sources. As far as data is concerned; the data sets are chronological with various variables related to both Wired and Wi-Fi usage across different states in India. Most importantly, the data set had been arranged by three study factors namely, (1) *Type of the internet connection*: this factor had been explained by two study variables such as *Wired* and *Wi-Fi,* (2)*Type of the business*: this factor had been explained by two variables such as *public* and *private*, and (3) *Usage region*: this factor had been explained by two variables *urban* and *rural*. These study factors together with their respective variables had been analyzed using aforesaid statistical techniques.

3.1.1. Objectives

Following are the objectives of the study.

1. Find present status of data usage across various states in India.
2. Compare usage to find most usage type, *ala* wired and Wi-Fi for data needs.
3. Forecast future trends and usage data needs by public with special reference to urban and rural areas.

Few statistical techniques such as multivariate correlation, forecasting through time series analysis had been used for realization of objectives. The following section provides analysis and interpretation. As far as tools are concerned; SPSS V20 was used for performing statistical analysis.

4. ANALYSIS

This analysis primarily addresses present digital divide based on secondary data. The data had been collected from certain reliable sources. Most of the data collected as a part of the literature were available as in different variables such as wired network usage and Wi-Fi usage. These services were organized in timely fashion whereby giving hope for comparisons as well as growth estimations. Following sections provide sufficient insights from the data analysis performed on data.

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4.1. Correlation

Correlation is useful for finding associations between variables of study. In this study correlation is used to associate two of the services called wired connections and Wi-Fi connections with respect to other study variables such as public vs. private, urban vs. rural in terms of connectivity.

Table 5: Descriptive statistics

	Mean	Std. Deviation
Wireline	32.3038	6.44658
Wireless	720.8031	378.0039
Public	105.9	24.00133
Private	647.2085	350.8203
Rural	306.63	162.696
Urban	497.4	178.686

Table 5 shows the descriptive measures for all the variables. The average number of Wireless connections is more than Wired. Private participation seems to be strong compared to public participation. Average number of connections in Urban seems to be higher than that of rural areas. This clearly shows digital gap.

Table 6: Multivariate Correlation analysis

		Wireline	Wireless	Public	Private	Rural	Urban
Wireline	Pearson Correlation	1	-.951**	-.725**	-.957**	-.985**	-.898**
	Sig. (2-tailed)		0	0.005	0	0	0
	Sum of Squares and Cross-products	498.701	-27821.38	-1346.794	-25975.71	-11032.63	-11049.86
	Covariance	41.558	-2318.448	-112.233	-2164.642	-1002.966	-1004.533
	N	13	13	13	13	12	12
Wireless	Pearson Correlation	-.951**	1	.883**	1.000**	.989**	.990**
	Sig. (2-tailed)	0		0	0	0	0
	Sum of Squares and Cross-products	-27821.38	1714644	96095.73	1590718	608528	668592.1
	Covariance	-2318.448	142887	8007.978	132559.8	55320.73	60781.1
	N	13	13	13	13	12	12
Public	Pearson Correlation	-.725**	.883**	1	.869**	.774**	.890**
	Sig. (2-tailed)	0.005	0	0	0	0.003	0
	Sum of Squares and Cross-products	-1346.794	96095.73	6912.764	87835.77	28760.54	36320.08
	Covariance	-112.233	8007.978	576.064	7319.647	2614.595	3301.826
	N	13	13	13	13	12	12
Private	Pearson Correlation	-.957**	1.000**	.869**	1	.992**	.986**

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	Sig. (2-tailed)	0	0	0		0	0
	Sum of Squares and Cross-products	-25975.71	1590718	87835.77	1476898	568729.9	621217.5
	Covariance	-2164.642	132559.8	7319.647	123074.8	51702.72	56474.32
	N	13	13	13	13	12	12
Rural	Pearson Correlation	-.985**	.989**	.774**	.992**	1	.958**
	Sig. (2-tailed)	0	0	0.003	0		0
	Sum of Squares and Cross-products	-11032.63	608528	28760.54	568729.9	291169.6	306321.2
	Covariance	-1002.966	55320.73	2614.595	51702.72	26469.96	27847.38
	N	12	12	12	12	12	12
Urban	Pearson Correlation	-.898**	.990**	.890**	.986**	.958**	1
	Sig. (2-tailed)	0	0	0	0	0	
	Sum of Squares and Cross-products	-11049.86	668592.1	36320.08	621217.5	306321.2	351217.2
	Covariance	-1004.533	60781.1	3301.826	56474.32	27847.38	31928.84
	N	12	12	12	12	12	12

Table 6 shows the details of multivariate correlation analysis. Correlation coefficients for all study variables appears to be negative for Wired connections whereas it seems to be positive for Wireless connections. This adds to the previous observation that there exists digital divide in the study population. All the correlation measures are strong and statistically significant. For instance, the Karl Pearson Correlation coefficient for public service in Rural areas is 0.774 with a P Value 0.003 (< 0.05) and the same for Private service in urban areas is 0.890 with P Value 0 (<0.05). This shows the association between Private service in Urban areas is stronger than Private service in Rural areas. In the same fashion, the difference between Wired and Wireless for both Rural and Urban is also vivid. The Karl Pearson Correlation coefficient for Rural with its association for both Wired and Wireless are negative for the values being -0.985, -0.8908 respectively with their P Values as zero for both relationships. Whereas the coefficients for Wired and Wireless for Urban areas seems to be positive and statistically significant.

4.2. Forecasting

As it was mentioned there is significant amount of chronological data in the literature. This data is highly precise and also reliable for they were gathered from certain official sources. Forecasting is useful to find current usage trend and there by estimating any future trends. Since this study is a comparison of two of the services with respect to two different geographies i.e., urban and rural. Following are the insights from time series analysis.

Table 7 : Rural, Urban, Public and Private Telephone Subscribers in India (Millions)

Year	Wireline	Wireless	Total	Rural	Urban	Public	Private
2006	40.22	101.87	142.09	18.54	123.55	61.08	81.01
2007	40.77	165.08	205.85	47.1	158.76	71.39	134.47
2008	39.41	261.08	300.49	76.5	223.99	79.55	220.94

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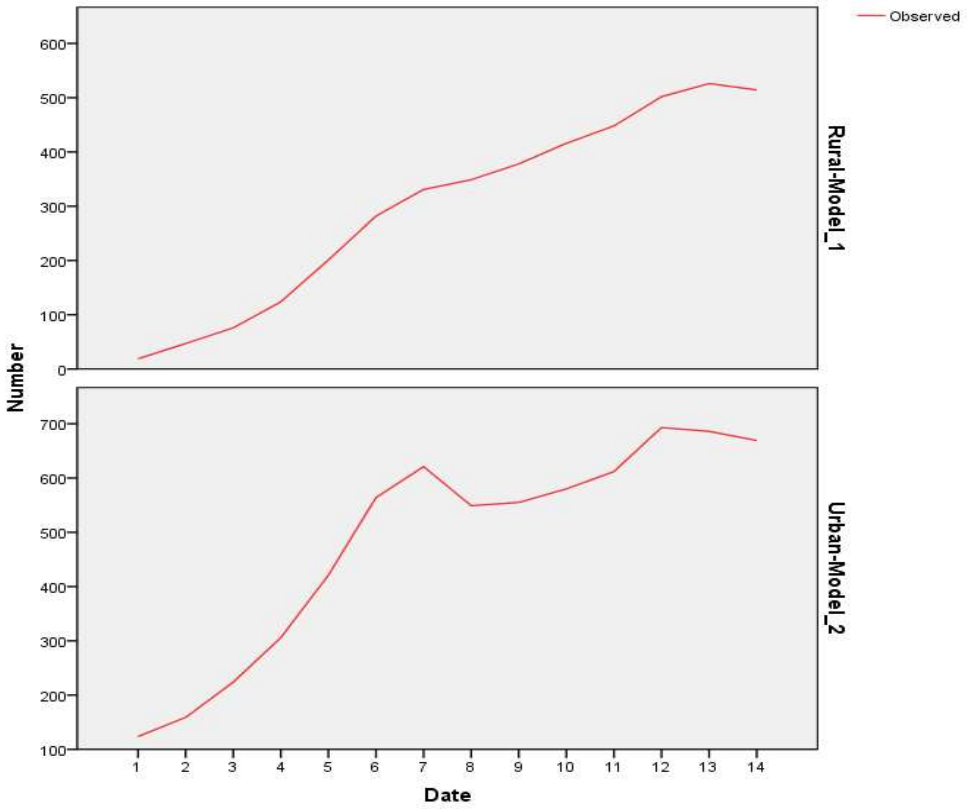
2009	37.96	391.76	429.73	123.51	306.21	89.55	340.18
2010	36.96	584.32	621.28	200.77	420.51	105.87	515.41
2011	34.73	811.6	846.33	282.29	564.04	126	720.33
2012	32.17	919.17	951.35	330.83	620.52	130.27	821.08
2013	30.21	867.81	898.02	349.21	548.8	130.11	767.91
2014	28.5	904.52	933.02	377.78	555.23	120.05	812.96
2015	26.59	969.54	996.13	416.08	580.05	100.34	895.79
2016	25.22	1034.11	1059.33	447.77	611.56	108.65	950.68
2017	24.4	1170.59	1194.99	501.81	693.18	122.18	1072.81
2018	22.81	1188.99	1211.8	525.87	685.93	131.66	1080.14
2019	21.70	1161.71	1183.41	514.27	669.14	133.51	1049.90

(Source: Department of Telecom Statistics for the year 2019 published on 27 Dec 2019.)

Figure 3: Connections for Rural vs Urban



The time series data from the year 2006 to 2019 pertaining to the number of wire-line and wireless telephonic connections in both urban and rural areas have been forecasted and the resultant graphs, i.e., Figure 3 indicates that there is a study growth in the rural areas whereas in the urban region there are fluctuations in the number of connections.

Table 8: Telephone Subscribers in India (Percent Share)

Year	Wireline	Wireless	Rural	Urban	Public	Private
2006	28.31	71.69	13.05	86.95	42.99	57.01
2007	19.81	80.19	22.88	77.12	34.68	65.32
2008	13.12	86.88	25.46	74.54	26.47	73.53

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2009	8.83	91.17	28.74	71.26	20.84	79.16
2010	5.95	94.05	32.32	67.68	17.04	82.96
2011	4.1	95.9	33.35	66.65	14.89	85.11
2012	3.38	96.62	34.77	65.23	13.69	86.31
2013	3.36	96.64	38.89	61.11	14.49	85.51
2014	3.05	96.95	40.49	59.51	12.87	87.13
2015	2.67	97.33	41.77	58.23	10.07	89.93
2016	2.38	97.62	42.27	57.73	10.26	89.74
2017	2.04	97.96	41.99	58.01	10.22	89.78
2018	1.88	98.12	43.4	56.6	10.86	89.14
2019	1.83	98.17	43.46	56.54	11.28	88.72

(Source: Department of Telecom Statistics for the year 2019 published on 27 Dec 2019.)

Forecast analysis on the percentage share of rural and urban wireline and wireless telephonic connections have been performed and the resultant graphs indicate that the percentage growth in urban areas is declining whereas in the rural areas there is an upward growth. It indicates that the demand for data usage in rural population is increasing. Overall the analysis indicates that the demand for internet in rural areas shows an upward trend when comparing with urban areas.

5. CONCLUSION

Data usage in various states in India have been studied and the common point in the data usage in all the states is that the rural area the number of connections is less when comparing with urban segment. Though the number of connections in Urban sector is more than rural areas, the growth in rural connections is more when comparing with urban areas.

When the study comes to wired and wireless connections reveals that, the usage of basic telephonic services is declining, and the data services are increasing every year in absolute terms. It is also observed that the public using more wireless connections in accessing the internet due to which the wire line connections are declining, and the wireless connections are growing.

The forecast of the timeline data pertaining to wired, wireline urban vs rural area usage reveals that the demand for the data services is in raising trend and even in this the rise will be more in rural areas when comparing with urban areas.

It is also observed that the gap between rural and urban segments in data usage is more. The Universal service obligation fund schemes for the purpose of provision of data services like Wi-Fi Hotspots, Wi-Fi Choupal and Wi-Fi at Rural Railway stations by Railtel. These schemes are being executed by BSNL, CSC and Railtel Corporations. These schemes are useful in provision of infrastructure to the rural segment for utilize the data services.

However, the reasons for this gap between rural and urban segments needs to be identified in future with more consistent yet suitable methods. The impact and sufficiency of the Universal service scheme needs to be assessed in further.

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