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Strategies to Bridge the Digital Divide : Urban Vs Rural Telecom Sector

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ABSTRACT

The last five years have seen a quantum jump in Tele-density, with the total number of subscribers jumping over 933.02 millions in April 2014. However, there exist a huge digital divide between urban and rural India. The Tele-density in urban India stands at 145.46% and the same figure is at abysmal 44.01% for rural India. Nearly 70% of Indian population still resides in rural area and agriculture contributes 17.5% to India's GDP. With such dependence on the rural economy and with 70% of India's population living in rural India, India's next level of economic surge can come from improving rural connectivity and bridging the digital divide. It is a well known fact that access to communication and information enhances economic opportunities and propels economic growth. Thus it seems a logical conclusion that we need to focus on enhancing rural connectivity such that India's majority population becomes a greater part of India's economic miracle. In essence, rural connectivity is the mantra for inclusive growth. The 12th five year plan has planned 1200 million connections by 2017, Mobile access to all villages and increase rural tele-density to 70 per cent by 2017. Broadband connection of 175 million by 2017, Make available additional 300 MHz of spectrum for IMT services, Making India a hub for telecom equipment manufacturing by incentivizing domestic manufacturers with thrust on IPR, Product development and Commercialization, Provide preferential market access for indigenously manufactured products, To increase domestic manufactured products in telecom network to the extent of 60 per cent with value addition of 45 per cent by 2017, adoption of green policy in Telecom and incentivise use of renewable energy sources. Five year plan has set a target of enhancing rural telephony substantially as it is a key driver for inclusive growth. This paper is an attempt to provide the strategies through Prof C.K. Prahalad 4A's model to increase the Tele-density in the rural area.

KEYWORDS Entrepreneurship, Business, Employment, Visionaries

Indian Telecommunication

The Telecom services have been recognized the World over as an important tool for socio-economic development of a nation. Telecommunication is one of the prime support service needed for rapid growth and modernization of various sector of the economy. It has become especially important in recent years because of enormous growth of information technology and its significant potential for the impact on the rest of the economy. The Telecom Sector, which has the multiplier effect on the economy, has a vital role to play in economy by way of contributing to the increased efficiency. The available studies suggest that income of business entities and household increases by the use of telecom services. Thus it contributes to the growth in GDP. A recent study by London business school found that, in a typical developing country, a rise of ten mobiles phones per 100 people boosts GDP growth by 0.6 percentage points.[1] The last five years have seen a quantum jump in Tele-density, with the total number of subscribers jumping over 925 millions in April 2014.[2] However, there exist a huge digital divide between urban and rural India. The Tele-density in urban India stands at 145% and the same figure is at abysmal 44% for rural India. Nearly 70% of Indian population still resides in rural area and agriculture contributes 17.5% to India's GDP. With such dependence on the rural economy and with 70% of India's population living in rural India, India's next level of economic surge can come from improving rural connectivity and bridging the digital divide. The position of Rural and Urban teledensity , % share of private vs public companies are shown in Table 1.1 below: [3] It is very clear that the total percentage of telephones are increasing yoy basis but the % by which there is growth in Urban area , the same is not reflected in rural areas.

Table 1.1 - Status of no of telephones, teledensity, % share of private Vs Public telephones services

Sl. No.	Item		At the end of March 2011	2012	2013	2014
1	Number of Telephones (in million)	Overall	846.33	951.35	886.02	933.02
2		Wire line	34.73	32.17	30.21	28.50
3		Wireless	811.60	919.17	867.81	904.52
4		Rural	282.29	330.83	349.21	377.78
5		Urban	564.04	620.52	548.80	555.23
6	Tele-density (Telephones per 100 persons)	Overall	70.89	78.66	73.32	75.23
7		Rural	33.83	39.26	41.05	44.01
8		Urban	156.93	169.17	146.64	145.46
9	%age share	Wireless	95.90	96.62	96.64	96.95
10		Public	14.89	13.69	14.49	12.87
11		Private	85.11	86.31	85.51	87.13
12	%age growth of Total Telephones-over previous year		36.22	12.41	(-)5.61	3.90

Source: Annual report -2013-2014, Department of Telecommunication

The increase in rural and urban teledensity is shown in Fig 1. [4]The Fig 1 clearly demonstrates that the gap between rural and urban tele-densities have been widening. The Teledensity which was 70.89% in March 2011 increased to 75.23% in March 2014. Thus there has been continuous improvement in the overall teledensity of the country. The rural teledensity which was above 33.83% in March 2011 has increased to 44.01% in March 2014. The urban teledensity has marginally decreased from 156.93% in March 2011 to 145.46% in March 2014.

Fig 1 Rural and urban teledensity, Source: Annual report 2009- 2010

Thus, there is wide gap between urban and rural teledensity. For economic and social

development of rural areas, rapid increase in rural teledensity is of utmost importance.

Rural Infrastructure[5]

The issues concerning the provision of rural infrastructure services should be tackled in a manner different from those concerning urban infrastructure. The need to draw this distinction arises from the fact that urban areas have characteristics which are vastly different from those of rural areas. These differences are largely in respect of population density, per capita incomes, and sparsely distributed populations. The population density in rural areas is much lower than that in urban areas. Urban population density as a multiple of rural population density varies from 3.79 in Kerala to 41.91 in Maharashtra. For the country as a whole, the figure is 15.75. Rural population density is greater than 500 per square km only in three Indian states – Delhi, Kerala and West Bengal. In 12 out of the seventeen states captured in table 1.2 it is less than 300 persons per square km. Such low density, for example, implies high per capita cost for setting up wired networks. In a situation like this, say for power sector, it might be a good idea to use mini generators instead of wired networks connected to the main grid. Similarly, in the case of Telecom, phone services based on wireless technology might turn out to be a moreeconomical option than say landlines.

Table 1.2 Urban and Rural Population Densities in Indian States in 2011

Rank	State / Union Territory	Population	Rural[26] Population	Urban[26] Population
1	Uttar Pradesh	199,812,341	131,658,339	34,539,582
2	Maharashtra	112,374,333	55,777,647	41,100,980
3	Bihar	104,099,452	74,316,709	8,681,800
4	West Bengal	91,276,115	57,748,946	22,427,251
5	Andhra Pradesh	84,580,777	55,401,067	20,808,940
6	Madhya Pradesh	72,626,809	44,380,878	15,967,145
7	Tamil Nadu	72,147,030	34,921,681	27,483,998
8	Rajasthan	68,548,437	43,292,813	13,214,375
9	Karnataka	61,095,297	34,889,033	17,961,529
10	Gujarat	60,439,692	31,740,767	18,930,250
11	Orissa	41,974,218	31,287,422	5,517,238
12	Kerala	33,406,061	23,574,449	8,266,925
13	Jharkhand	32,988,134	20,952,088	5,993,741
14	Assam	31,205,576	23,216,288	3,439,240
15	Punjab	27,743,338	16,096,488	8,262,511
16	Chhattisgarh	25,545,198	16,648,056	4,185,747
17	Haryana	25,351,462	15,029,260	6,115,304
18	Delhi	16,787,941	944,727	12,905,780
19	Jammu and Kashmir	12,541,302	7,627,062	2,516,638
20	Uttarakhand	10,086,292	6,310,275	2,179,074
21	Himachal Pradesh	6,864,602	5,482,319	595,581
22	Tripura	3,673,917	2,653,453	545,750
23	Meghalaya	2,966,889	1,864,711	454,111
24	Manipur	2,570,390	1,590,820	575,968
25	Nagaland	1,978,502	1,647,249	342,787
26	Goa	1,458,545	677,091	670,577
27	Arunachal Pradesh	1,383,727	870,087	227,881
28	Pondicherry	1,247,953	325,726	648,619
29	Mizoram	1,097,206	447,567	441,006
30	Chandigarh	1,055,450	92,120	808,515
31	Sikkim	610,577	480,981	59,870
32	Andaman and Nicobar Islands	380,581	239,954	116,198
33	Dadra and Nagar Haveli	343,709	170,027	50,463
34	Daman and Diu	243,247	100,856	57,348
35	Lakshadweep	64,473	33,683	26,967
TO-TAL	India	1,210,726,932	833,087,662	377,105,760

The other major difference between urban agglomerations (towns) and rural agglomerations (Villages) is their size. Average town population as a multiple of average village population varies from 4.55 in Kerala to 253.73 in Delhi. Kerala is an aberration in this respect as in all other states considered in table 1.2 this figure is greater than 20. The average population of an Indian village is 1070 persons. For 14 out of the 17 states considered here the average village population is less than 2000 persons. When the population of an agglomeration is so small the solution to infrastructure problems will necessarily have to be different. For example, setting up of large water treatment plants and modern piped water supply and sewerage networks in thinly populated agglomerations are ruled out. Instead it would suffice to have small water treatment plants, or stand posts and sanitized pit latrines1. Again our recommendations do not hold for the large villages in Kerala (15,470 people) and Delhi (4,770 people).

Another characteristic which distinguishes the urban areas from rural areas is the average Purchasing power of people, with the urban dweller being much wealthier on the average than the rural dweller. The excess of urban per capita income over rural per capita income varies from 22% in Haryana to 180% in Orissa. Only in three states is this figure less than 50%. In 13 out of the 17 states listed in table 1.3 the level of rural per capita income is less than Rs. 12,000. The low level of rural per capita income (as opposed to the much higher levels of urban per capita income) implies that in most rural areas pricing of infrastructure services cannot always be structured so as to recover the entire capital and operating and maintenance cost over the lifetime of the capital asset. Irrespective of whether the service is provided by the government or the community or the private sector, there is a clear need for provision of a subsidy to the consumer of rural infrastructure services. The extent of subsidy so designed will need to take into account the consumer's willingness to pay for the concerned service. This can take place either through direct or indirect means. Exceptions to this generalization exist in the case of Punjab, Gujarat and Haryana, which have per capita incomes greater than Rs. 14,000. It must be remembered that Uttar Pradesh and Bihar are the only states which have urban per capita incomes less than this figure.

Rural and Urban Per Capita Incomes (1999-2000)

States	PCY (Rural)	PCY(Urban)	% Difference
Orissa	5704	15993	180.38
West Bengal	8792	23892	171.75
Meghalaya	9284	20714	123.12
Madhya Pradesh	7059	14719	167.92
Maharashtra	11769	23747	101.78
Tamil Nadu	12888	24246	88.13
Himachal Pradesh	10816	19881	83.81
Uttar Pradesh	6738	12257	81.91
Bihar	6976	12404	77.81
Andhra Pradesh	11033	19143	73.51
Kerala	10342	17372	67.98
Karnataka	11300	18394	62.78
Goa	11017	17440	58.30
Gujarat	14574	22742	56.05
Assam	11109	17231	55.11
Rajasthan	10693	15850	48.23
Punjab	16540	21413	29.46
Haryana	14855	18134	22.07

Source: Indian Market Demographics Report, NCAER

Hurdles in Penetration in Rural Market

There are, however, several hurdles faced in increasing the penetration of telecom services in rural areas.

a) Supply Side

Backbone Infrastructure

Currently around 6.7 lakh route kilometers of optical fiber is present across India and out of 35000 exchanges in the country, 30000 exchanges of the incumbent have OFC connectivity (these include OFC connectivity of about 27000 exchanges in rural areas). In addition, satellite systems offer high bandwidth connectivity all across India through VSAT. In spite of the existence of this nation-wide fiber network adequate connectivity to villages is not available to an entrepreneur other than the facility owners. The cost of installing backbone infrastructure in semi-urban and rural areas for a new entrepreneur can be substantial, and it is in the interest of economic efficiency that the existing infrastructure is fully utilized.

Infrastructure sharing

According to industry estimate, setting up a cellular tower (BTS) cost around Rs.50 lakhs inclusive of equipment, power plant, etc. Significant number of existing cell sites are already being shared by competing operators across the country mainly in urban areas. In rural areas, sharing infrastructure will reduce costs and the advantages may be quite substantial, depending on how the win-win situation is created by operators. The incumbent and the owner of majority of the rural infrastructure did not wish to give up its first mover advantage by sharing his own infrastructure. However, other operators having experienced the advantages of sharing of infrastructure in urban areas are quite keen for the same.

Last mile connectivity

Last mile connectivity to sparsely distributed households is more costly than in densely populated areas. Wireless technologies overcome this hurdle and seem promising for the provision of multi-service broadband and voice connectivity. Making spectrum available for rural wireless deployments at reasonable costs either through special low rates or through financial support from USO Fund will help bring costs down and encourage the innovation and deployment of advanced wireless technologies. Providing support for last mile connectivity will help in rapid rural network deployment.

Power Supply

Unavailability of reliable power supply in semi-urban, rural and remote areas increases operational costs because they have to maintain sufficient backup systems. Alternate energy sources could mitigate this problem, but might be costly to install and maintain.

Operation and Maintenance cost

Maintenance costs of the network in rural areas are higher as compared to urban areas because of several factors such as poor transportation systems, difficulty in supply of spare parts and non availability of skilled manpower, etc. in these areas. Operational cost for satellite technologies such as VSAT in rural areas is also higher because of additional cost of the bandwidth incurred by the operator and taxes.

Duties, Levies and Taxes

Currently, as shown earlier, duties, levies and taxes are very high. The net result is that the offered service cost becomes higher and unattractive to rural population and enough resources are not left with the operator for major rollout.

Licensing Framework

We have seen that technological developments especially built around IP networks have resulted in convergent networks in which one single network offers a variety of services. As has been pointed out in the TRAI Recommendations on Unified Licensing (TRAI consultation paper, 2004) the earlier service specific licensing is losing meaning owing to the fact that service providers of one type step into the services of another type of license using the same network. The increasing capability of wireless technologies and its use in the modern cellular mobile technologies irrespective of whether they are based on the so called 3G technologies or beyond 3G technologies have created a totally new situation. It is, therefore, anticipated that for the rural areas where the demand is clearly identified to be substantially multimedia type, a change in the licensing framework will be extremely beneficial.

b) Demand Side

Cost of Handsets and Access Devices

Lower income rural households may perceive mobile handsets or access devices as expensive. The cost of handset constitutes an entry cost and is, therefore, an important barrier for growth of mobile services. Recently single chip cell phone solution was launched in India that will bring down the cost of handsets, making the Rs. 1000 mobile a reality. Such single chip solutions are expected to reduce power consumption by 50 per cent.

Unavailability of locally relevant applications

Physical and financial access to telecommunications services are only two dimensions of the rural-urban divide. It is also important to increase content access – that is, create applications and services which are useful to local population. These could include e-governance, e-health, e-education and commercial applications in local languages. With proper communication infrastructure it may be possible to move business processes to rural regions. This should open up the growth potential of rural Indian economy.

Affordability of Services

There is evidence to suggest that people will spend up to 2% of their income on phone calls if a phone is available to them, even in rural communities. The number of cable TV homes in India is more than fixed line phones. This indicates even lower income population has a demand for entertainment and information services. Cellular service providers have already begun to introduce innovative schemes in urban markets to increase affordability of services. For example, operators like Reliance, Bharti and Hutch have introduced micro prepaid cards that accelerate growth and increase operator margins. Similar schemes in rural areas will only serve to increase their market share and service penetration.

Government Policy for Rural Telecommunication

According to the government policy announced in year 2012, govt want to achieve 70% of rural penetration by 2017 and 100% rural telecom penetration by 2020. To achieve this target Government have announced various Policies like Merger and Amalgation scheme, unified licensing, FDI Policy, Universal service obligation fund, National optical fiber network, mobile communication services in the left wing extremism effected area, shared mobile infrastructure scheme, rural wire line broad band scheme.

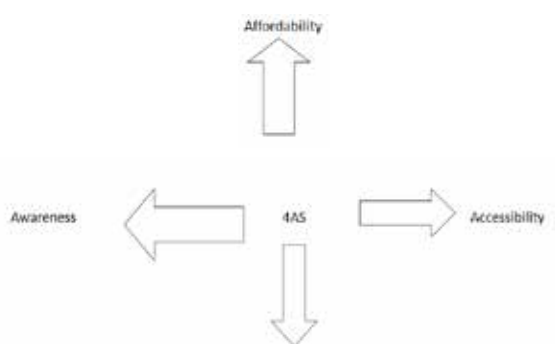
IMPORTANCE OF TELECOMMU NICATION FOR RURAL MARKET

There is no doubt about the linkage of economic prosperity (in

terms of GDP per capita and teledensity of a country) and to achieve a higher teledensity in a country like India where around 70% population lives in rural areas, it is necessary for telecom services to penetrate into rural areas if we have to increase the teledensity in the country and we as a nation also join the club of developed countries where very high level of telecom penetration has already been achieved.

- Based on international experience in various countries it has been estimated that the penetration of telecom services enhances the productivity and wealth generating capabilities of the local population which in turn increases the GDP of the country.
- This is not a new hypothesis and it has already been demonstrated at thousands of locations within and outside the country that a largely self-sustainable business model can be created for these telecom services even in most backward areas.
- It is to be kept in mind that connectivity is not an end in itself. We have to see that what the rural people do with the computers and connectivity.
- Various applications useful to the local population are to be developed and we have to go beyond tele-education and tele-health and revitalize the rural economy by creating rural micro enterprises.
- These micro enterprises could be in the areas of agriculture, food processing industry, animal husbandry, fisheries, sericulture, handicrafts, etc.
- Urban India can outsource their IT based services to rural India. Government would outsource works like digitization of land records, birth – death certificates and variety of data entry works to the agencies or small entrepreneurs in rural areas. This would enable these enterprises to create wealth in rural areas.
- Recently Government of Thailand has taken an initiative to promote local Thai products in the global market. This is called ONE TAMBON ONE PRODUCT (OTOP). These products are very carefully chosen from each locality (Tambon) in a rigorous selection process and a range from food, textiles, accessories, handicrafts, decoration items, furniture and herbal products. This type of projects can be initiated in our country also where broadband telecom connectivity at village level would give an opportunity to our rural population to publicize their products in world market. (Source: Time Magazine issue September 20, 2004)

4. The 4As FRAMEWORK



Availability the first A is about making the product reach the consumers and in the case of telecom services studies have shown this to be the biggest barrier to be overcome (Anderson and Biliou, 2007). It has been acknowledged by many that distribution systems are the most critical component and a barrier which needs to be overcome (Prahalad & Hammond 2002) for success in marketing in rural areas. The task of distribution in these areas is considered to be more difficult than in urban areas (Mandira, 1977), low density of population and inaccessibility makes the problem of servicing villages individually difficult and often uneconomical. Direct delivery of goods even to the top one percent of villages cost twice as much as servicing urban markets (Ganguly 1985). To overcome the difficulties posed in distribution a phased spread of the services is recommended, wherein bigger villages can be targeted first, then the ones which are near a small town and connected and last would be the remote villages. In the distribution the importance of small town markets cannot be ignored and need to be given importance as besides being a point of distribution they can also be used for promoting products as villagers tend to come to the town frequently for either purchase of agricultural inputs or sale of their produce.

Acceptability

would include issues needed to be addressed to improve the willingness to consume, distribute or sell a product. It would also include how the product or service could be made more acceptable to the rural consumers by incorporating features which would make it attractive to them. With a telecom service there are two basic components of the service one being the handset and second being the recharge coupons. Innovation is needed at both the ends to be able to tackle both the issues. **Affordability** issues in telecom would include two sets of issues, the first being a fixed cost and an initial barrier for a villager to start with the service needs to be brought down and many companies including the market leader Nokia are working on low cost handsets which could be of use in rural areas. Within the product there is a need for customization in terms of language and user friendliness. The rural population where illiteracy is very high needs to be taken into consideration before coming out with the product and the feature which would be included in the product need to be rethought; the needs of rural consumer need to be taken into consideration. In a rural area a radio combined with a mobile might make more sense to the rural consumer than perhaps a camera. And while designing the phone one needs to keep the problems related to the power shortages in the villages.

The second component of recharge also needs to be tailored according to the needs of rural masses. The availability of disposable income in rural areas is cyclical relate to agricultural cycles and thus the recharge coupons provided in the urban areas might not be suited to the needs to farmers and the promotions and schemes to be used in these markets also need to be in accordance with the agricultural cycles. And it has been shown through the success of single use small packs that the cost per-use is more important than the cost of the overall product or service. The last A, **Awareness** is linked to the issues of promotion of telecom services in rural areas. The promotion of the services also needs to be adapted to the village environment; the language and means of communication used should be in the local language.

Strategies to Increase the Rural Teledensity (4 A's Model)

1) Affordibility[xii]

The key resource of capital is already available for the purpose of enhancing rural connectivity in the form of United Services Obligation Fund (USOF). All operators contribute 5% of their revenues to these funds. The quantum of funds aggregates is nearly Rs 25000 corers. Utilization of these funds is reportedly an abysmal 27%.

In order to successfully enhance rural telephony, the key issues of Access services and Backhaul services need to be addressed. These services are expected to utilize majority of the USO funds. Other uses of the funds can be towards subsidizing services and local needs such as obtaining real estate and right of way. However, the key point to note is that a mapping of the entire nation needs to be done to assess the need for creation of Access services and backhaul services. It may be also be noted that vast amounts of OFC, microwave, towers etc already exist by the virtue of networks of GAIL, Railtele, Power Grid, BSNL, Reliance and Airtel. Vast unexplored potential vests in the creation of an integrated network to enhance the national network backbone.

Unified licensing Regime
Unified Licensees shall optimize their resources by offering all kinds of services. This will help in reduction of input costs. The concept of Niche Operators has also been introduced in the Unified Licensing. This enables operators to provide services at lower prices and costs in backwards areas. It may be recalled that mobile networks will only cover about half the villages. Internet/Broadband connectivity in these villages can be given by ISPs. Several other villages could be covered through the 'Niche operator' concept. These villages will be those that have less than 1% teledensity, as defined for the 'Niche operator' concept in the Unified Licensing draft recommendations by TRAI.

Spectrum Related Issues: -
Considering the growth of wireless services, TRAI is of the view that it is necessary that spectrum availability at reasonable price or at lowest possible price is one of the key objectives. Authority is aware of the fact that if a scarce commodity like Spectrum is available at a very low price, then operators may have a tendency not to use it efficiently. Most of future growth in telecom services has to be achieved in rural areas. TRAI is exploring the possibility of either drastically reducing the spectrum charges in rural area or make it 'Nil'. Delicensing of spectrum for introduction of **wi fi** and **wi max** technologies is of utmost concern to the TRAI. TRAI considers that with 1 billion population and only 24% teledensity, there is a big opportunity to leapfrog for introduction of all new technologies so as to make the telecom services available to rural areas at affordable price.

Broadband Internet Growth :-
Government has recently come out with Broadband Internet Policy. Govt expects that we will surpass the targets set therein for Broadband Internet Services. In other countries, for example South Korea and Malaysia, their Governments had to spend lots of money through infrastructure projects and subsidy to achieve widespread networks and broadband connections. Only after these funds were invested and projects completed did those countries start seeing any benefits of having these networks and extensive e-governance. On the other hand, in India, we are lucky to have a strong and rapidly growing telecom industry. Both public and private players have already covered the country extensively with their networks. By the end of next year we will have international bandwidth connectivity of 16Tbps. We have only lit 0.34 Tbps so far. BSNL already has 30,000 exchanges which are connected by fiber. This implies an average of 4-5 exchanges per block are connected by fiber. In addition, private operators like Tata, Reliance and Bharti have laid their own new networks. Leased line providers like Railways, Power-Grid and GAIL have also laid large optic fiber networks. Most of this capacity has not been lit. It is evident that by using the existing infrastructure, it would be possible to connect the entire country without sizeable incremental investment. Lighting up fiber optical network is only 20 per cent of the costs of laying down the network. For extending the fiber connectivity up to each village, wireless connectivity including WiFi/Wi-Max or in some cases just tapping existing fiber could be considered. Thus there are enough existing resources in the country to launch major internet, broadband, telephone connectivity and e-Governance projects. However, this has to be done in the most economically viable, efficient and beneficial manner.

Reduction in domestic and International Lease Line Tariffs
Indian Government is aware of the fact that availability of lease line and its tariffs plays a very vital role in growth of telecom services in the country. While finalizing these tariffs Government will keep in mind the available optical fiber infrastructure both in domestic and international sector and continued investment in infrastructure growth.

Existing Projects to increase telecom penetration in rural areas
There are many broadband/internet projects primarily for rural areas, which have been implemented by various State Governments/NGOs or Corporate Houses. Some of these projects are:-

ITC e-Chaupal , N-Logue, MS Swaminathan centre in Pondicherry, Akshaya in Kerala, Gyaandoot in MP with focus on e-Governance, Bhoomi in Karnataka , E-seva in Godavari District of AP , Warana in Maharashtra by NIC, Aksh Broadband, Jagriti in Punjab

In these projects the connectivity to rural areas is through satellite, microwave link, copper, fibre, etc. as shown in figure 2.1, depending on what is available already or has been specially installed for this purpose.

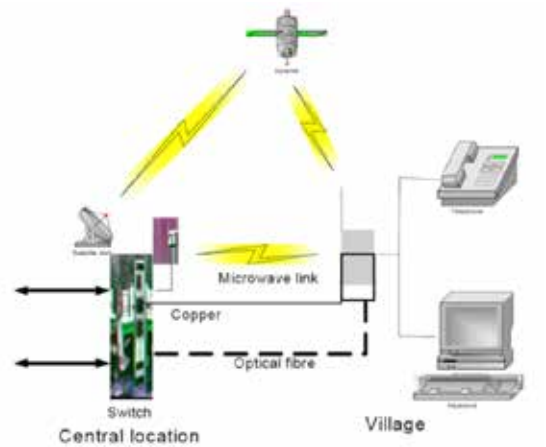


Fig 2.1 The connectivity to rural areas is through satellite, microwave link, copper, fiber, etc.

Sharing of Infrastructure
Another initiative to reduce the cost of providing telecom services is sharing of infrastructure. Several countries in Europe, Australia are using infrastructure sharing model to reduce the cost of offering of telecom services. Some of the examples are white zone concept in France, sharing of infrastructure between two mobile operators in Australia to offer 3G services, sharing of infrastructure among various mobile operators in Europe for 3G services. The question comes whether it should be left to market forces to decide the mode of sharing the infrastructure, the commercial terms and conditions or Regulator should mandate it. In India also, Authority has noted that operators are sharing infrastructure but it is to be considered that pace has to increase specially to improve the mobile coverage in rural areas. In fact, like in France operators could even divide the areas and have roaming arrangement to each other's subscribers when they roam in these areas. One may argue that it may lessen the competition but considering large number of operators in all service areas, still competition will be available. This could be just an initial impetus to increase penetration of mobile services in rural areas.

2)Availability
The biggest challenge to serve the rural market is to ensure the availability of mobile products and services unlike the urban market distribution channel in the rural market is not developed. Access Services in rural India can be achieved by **creating clusters of Access Service Islands** with connectivity either wire line or wireless, whichever may be more efficient Terrain-wise and cost wise. A combination of some of the following may be used to create the Access Services infrastructure:
- Towers
- Electronics
- MSCs
- BTS

The creation of these islands in isolation will not be of much use unless they are connected to the national network. This requires **backhaul services**, which can link these islands

to the national network, enabling them to reach out to the world.

Backhaul Services

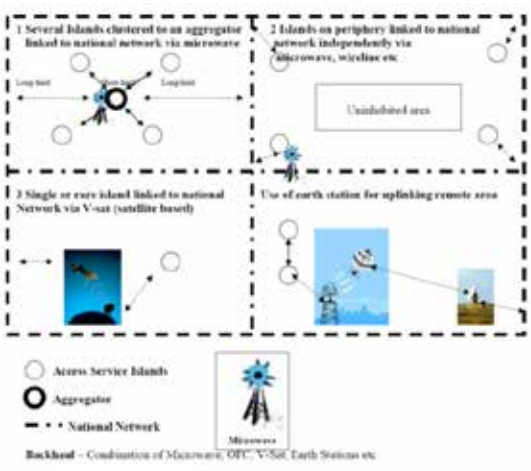
The creation of effective backhaul services is a key ingredient to the successful enhancement of rural telephony penetration. This will effectively put the various scattered Access Service islands on the nation map. Some of the various tools that can used to create an effective backhaul network include:

- OFCs
- Microwaves
- VSATs
- Earth Stations

It may be noted that extensive networks of various organizations especially PSUs are already in existence with fairly deep penetration like that of GAIL, BSNL, Rail Tel, Power Grid, Reliance and Airtel amongst others.

Access Services and backhaul services

Creation of Access Services in conjunction with short-haul and long-haul is key to putting rural areas on the national network. This can be done via a combination of v-sats, microwaves, earth stations, OFCs etc. for creating points of presence. The depiction below suggests some of the examples of Access Services islands and clustersthat could be formed and how they could link up to the national network.



Brief descriptions of select networks

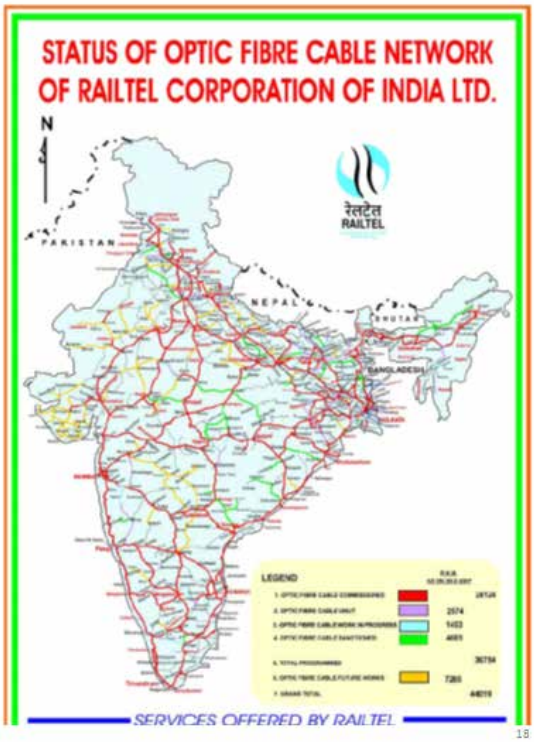
GAIL

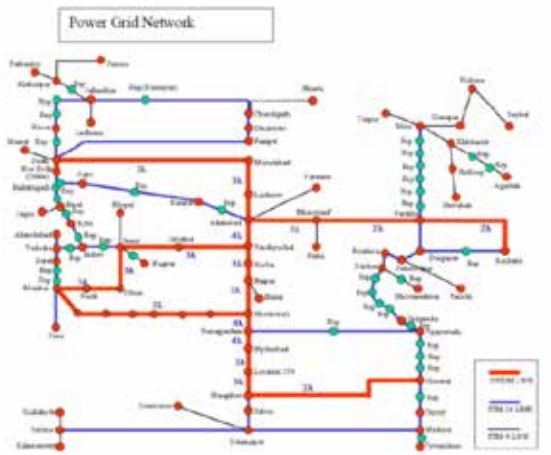
GAILTEL service arm of GAIL, is engaged in providing GAILTEL services to mission critical in-house SCADA and ERP services apart from commercially leasing services to GAILTEL Operators and ISP's across India. GAILTEL has been operating commercially in the Indian GAILTEL sector since June 2001. It is also responsible for meeting the captive communication requirements of GAIL's pipeline installations. GAILTEL, today serves most of the GAILTEL operators of the country, which include HUTCH, VSNL, Airtel, Idea Cellular, Reliance Infocom, Tata Tele services, to name a few. Its high speed optic-fiber network extends to well over 13,000 Km connecting and Kerala.

RailTel Corporation of India Limited (RailTel)

RailTel Corporation of India Limited (RailTel) is a Government of India undertaking under

The Ministry of Railways. The Corporation was formed in Sept 2000 with the objectives to create nationwide Broadband Telecom and Multimedia Network in all parts of the country, to modernize Train Control Operation and Safety System of Indian Railways and to significantly contribute to realization of goals and objective of national telecom policy 1999. RailTel is a wholly owned subsidiary of Indian Railways, with authorized capital of Rs.1000/- Crores. Indian Railways have seamless Right of Way along 63,000 KM of Railway Track passing through 7000 stations across the country. The stations in major cities are located in centralbusiness districts. Indian Railways already had established a strong Telecom Network to meet its communication requirements. With the formation of Corporation, Indian Railways' Right of Way and OFC assets have been transferred to RailTel. Presently, about 32500 KM of OFC has already been laid and over 29500 KM has been commissioned. Works on another 10620 KM are in various stage of completion





Power Grid Corporation of India Ltd

Power Grid Corporation of India Ltd., the Central Transmission Utility of the country, a leading Public Sector Undertaking owns, operates and maintains one of the largest power transmission (~68,500 ckt kms) network in the world. POWERGRID's telecom network provides a robust telecom highway at affordable cost with ultra modern and eco-friendly implementation techniques. Its telecommunication network benefits from the extensive geographic reach of its power transmission network, which covers all the main territories of India including remote areas of Jammu & Kashmir, Himachal Pradesh and the North Eastern region (Assam, Manipur, Meghalaya, Nagaland and Tripura). POWERGRID has a nationwide backbone network to provide broad band capacity to various telecom service providers like ISP's, Cellular operators, Basic service providers, NLDO's, ILD's, Paging operators, Call centers, tele-medicine, Government Departments, Broadcasters, Corporate for voice, data and video and also other higher value added telecom services.POWERGRID has diversified into telecommunications and has:

- National Long Distance License
- Internet Service Provider–ISP (Category A) License

Unique Features of Powergrid's Telecom Network

Most of the POWERGRID's optic fiber backbone network is laid overhead on the extra highVoltage power transmission lines and therefore offers a distinct advantage over the underground optic fiber network in terms of robustness, vandalism proof, rodent and termite proof, thus offering high reliability.

- Instant bandwidth allocation on POWERGRID's Telecom route
- End to end connectivity
- Instant up gradation to higher capacity
- Better Service Level
- Services catering to the specific needs of the customers
- High reliability, high quality service in a cost effective manner

3) Awareness

Many rural customers are largely inaccessible to conventional advertising media-for example in India only 41% of poor rural household have accss to TV- building awareness is another challenge for companies wishing to serve low income consumers in the developing world . To overcome these constraints, investment heavily in billboard(Smart), point of sale marketing in stores(Sari,Sari, Thailand), developed advertisement suitable to attachment to rail, local transport medium. Engaging the existence formal and informal community networks is an approach that has been successfully adopted by many innovative mobile providers. Hexagon in Rajasthan, recognizing that women tended to be under represented as users of its services, sponsored a series of local festivals that were specifically targeted at women and young people The most explicit recognition of the important role played by women in village life is the Grameen phone system, which has had a big impact is on the life of a women. Known as Grameen phone ladies, Women entrepreneur received microcredit to purchase phone and manage their use among the village. The women provide villagers with a major link to services in a country that is poorly served by the telecommunication companies. Viral marketing is one of the most effective forms of advertising which can also increase the awareness.

4) Accessibility

There are many broadband/internet projects primarily for rural areas, which have been implemented by various State Governments/NGOs or Corporate Houses. Some of these projects are:-

- ITC e-Chaupal
- N-Logue
- MS Swaminathan centre in Pondicherry
- Akshaya in Kerala
- Gyaandoot in MP with focus on e-Governance.
- Bhoomi in Karnataka
- E-seva in Godavari District of AP
- Warana in Maharashtra by NIC
- Aksh Broadband
- Jagriti in Punjab

In these projects the connectivity to rural areas is through satellite, microwave link, copper, fiber, etc. as shown in figure 2.1 depending on what is available already or has been specially installed for this purpose. Some of these ongoing projects were analyzed to examine their self-sustainability aspects. Salient features of four of these projects, especially highlighting the financial viability aspects. Analysis of these four projects indicates that these business models may not be sustainable on their own if implemented on countrywide basis specially in the initial years of their operations. At the same time, giv-

ing away direct subsidy may also not be a desirable solution. Under these circumstances, to facilitate the growth of these projects, Government may support them by ensuring that necessary inputs are made available to them at reasonable and lowest possible costs. For example, spectrum for such projects, especially in rural / remote areas should be made available at low cost or free of cost. The pricing in such areas should also logically be very low. With low prices relatively large demand can be generated, making these projects more attractive and sustainable. The bandwidth for connectivity should also be given to such projects at a low cost or free for an initial period of 5 years or until such time that bandwidth prices fall low to be affordable for widespread use, approximately more than a 75% decrease. The bandwidth providers giving this free bandwidth or at low cost should be subsidized from Universal Service Fund. The price of this bandwidth could be determined by the Regulator particularly since all this bandwidth, at present, is lying unutilized.

Recently, Chairman, WIPRO and Chairman MICROSOFT, India has indicated their plans to bring down hardware and software costs very substantially for rural broadband and connectivity projects. The project costs also have to be reduced by substantially reducing spectrum and bandwidth costs.

At present these projects are scattered attempts in different areas by different organizations. One should analyze these projects in detail and work out a suitable model for self-sustainability of these projects. Efforts are required to be made to make such projects self-sustainable and multiply such projects. A significant Government initiative involving corporate/ NGOs/State Governments in implementing these types of projects would be effective in launching major broadband/internet/rural connectivity/ e-governance projects as visualized by the Hon'ble Prime Minister. The Government can involve such bodies also for undertaking projects in different geographical areas in the country.

Lowering the cost of handset / SIM prices

a. The receipts from sale of handsets, accessories, etc. should not be included in AGR of the service providers as the service provider himself purchases these items (and also that the Subscriber is entitled to purchase these items from anywhere in the open market. The exclusion of sale of handsets from AGR would be a very big incentive that could push services in the rural areas.

b. The one of the most successful ways of bringing down the cost of going mobile has been micro financing, as has been shown by Grameen Bank example in the paper. USOF can enable tie up with some of the nationalized banks to facilitate Micro financing of handsets to rural consumers in specific areas at lower interest costs.

c. Moreover, the operators are offering host of services including m-commerce & vernacular services on the sim and for the same, it is critical to have higher memory sims (64K). In order to bring the cost down, we recommend zero duty / tax, which will enable the operators to move to higher memory Sims across segments.

Mobile Banking and Use of Postal Servic es for spread of telephony in rural areas

The postal department could be used as a medium to promote mobile services in rural areas. There is a need to educate the potential customers and the first time users about the uses and benefits of the mobile services and the postal dept. is best placed for undertaking the same.

The strong presence of postal service across the length and breadth of the country could be leveraged by service providers for expansion of mobile services in the rural and far flung areas. The postal dept. could work as a sales outlet, bill collection center and enable verification of subscribers.

Conclusion

The Telecom sector in India has witnessed unparalleled growth by global standards. In a little over a decade of wireless telephony, India has moved from a subscriber base of Zero to becoming the second-largest market in the world after China. This growth would continue provided we have progressive policies that shall provide impetus to free flow of investment, ideas and technology that facilitate growth and evolution of this sector both in urban and rural area. The progress in the sector has been something to be proud of and it is often viewed as ample testimony to the India growth story. The strongest growth in the telecom industry is now going to come from rural markets. By leveraging the 4As – Availability, Affordability. Accessibility and Awareness the telecom service provider can achieve growth and profits in rural market. Delivering the 4As will enabled telecom service provider in rural market to provide significant social good.

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