4 RURAL TELECOM

PART I RURAL TELECOM AND IT

Pradip Baijal and Rekha Jain

Introduction

Economic reforms in the post-1991 era have radically changed the Indian economy with maximum impact on the telecom sector. Telecom regulations and the explosion of competition in the telecom market raised teledensity in India dramatically to 12.7 per cent in 2006 from 1.94 per cent in 1998. However, not much has changed for the more than 70 per cent of the Indian population living in rural areas and this is a major cause for concern. In 2006, we find that the rural teledensity is still hovering around 2 per cent (from 0.4 per cent in 1998), whereas urban teledensity is above 35 per cent. In metros like Delhi, Mumbai, Bangalore, and Chennai, the tele-density is around 50 per cent (TRAI 2005b).

Since teledensity has a positive relationship with the level of development, the large differential between rural and urban tele-densities is a symptom of serious developmental differentials as well and should receive adequate policy attention both in terms of analysing the causes as well as for devising strategies for bridging the gap viably.[1] TRAI's observation that, 'A time has come that our policies of reaching telecom to villages are looked at as 'Universal Service Opportunity' rather than 'Universal Service Obligation', is appropriate (TRAI 2005b).

Access to telecom services including internet and broadband services, provides new and exciting opportunities for the users. Rural populations suffer the double jeopardy of not having proper road and public transport facilities and other infrastructure of urban areas in addition to being deprived of telecommunication services as well. This intensifies economic imbalances and inequalities which are already in staggering proportions.

Communication technologies help in poverty reduction in three ways: (i) increasing the efficiency of the individual and thereby, of the entire economy, (ii) ensuring better delivery of public services, such as health and education, and (iii) creating new sources of employment, income, and training particularly for the poor population. Low cost wireless solutions are now available for rural areas at affordable prices. Business innovations such as pre-pay options have reduced the entry price at the lower end of the market and enabled easy access for multiple services in areas where fixed telephone infrastructure is poor.

Rural India will ultimately define the core strength of the industry, since the sheer volume of potential connections is immense. Inclusion of rural users in the customer base will strengthen the network and enable it to deliver multiple services in communication-starved rural areas. Since the prices of wireless telephony and communications both at the entry level as well as the recurring expenses have come down drastically due to overall growth, there is a huge demand for such services in rural areas also. However, dispersed and low density rural markets make it less profitable for private operators to enter such areas and compete with cheaper fixed line telecom rates in rural areas.

[1] See Part II on 'Accelerating Rural Telecom Penetration: An Empirical Analysis'.

An important trend is the emergence of community access to both basic and value added services. While individuals in many poor locations may not be able to afford the upfront costs of owning telephones and internet-enabled PCs, a community as a whole may be able to afford the facility. As entry costs of mobile telephones and PCs and their recurrent costs are plummeting, particularly when viewed from the cost–benefit perspective, the scenario is changing rapidly.

Rather than the present model where only one (or a few) connection is given in a village at prohibitively high prices with consequently high capital and yearly subsidy implications, a one time subsidy to the service providers would go a long way in creating a rural telecom market where services can be delivered efficiently in a competitive environment.

Status of Rural Telephony

India's tele-density in 1948 was 0.02 per cent. The telecom industry was for the exclusive preserve of the public sector. All Five Year Plans, and successive governments placed strong emphasis on telecom development. Yet in 1998, the tele-density was only 1.94 per cent, displaying an incremental growth of 1.92 per cent in the fifty year period post-Independence, indicating an average yearly growth of 0.04 per cent. After the introduction of telecom regulation in 1997 and liberalization of the sector, growth accelerated 12.5 times over the non-liberalized monopoly years. Competition regulation was introduced in 2003 and it led to a growth of 2 per cent in 2003–4 and again in 2004–5. With stabilization of competition regime, tele-density increased by about 3 per cent in 2005–6 and at the present monthly rate of growth, it would increase by more than 5 per cent during 2006–7, 125 times the growth in 1948–98 (Figure 4.1.1).

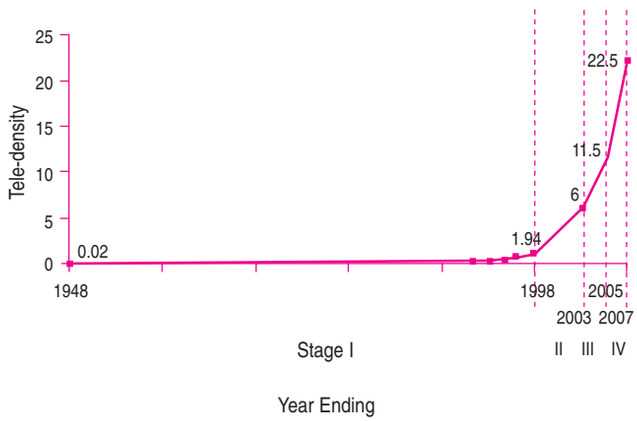

Fig. 4.1.1 Telecom Growth: The Changing Scenario

Source: TRAI (2005b) and TRAI (2006).

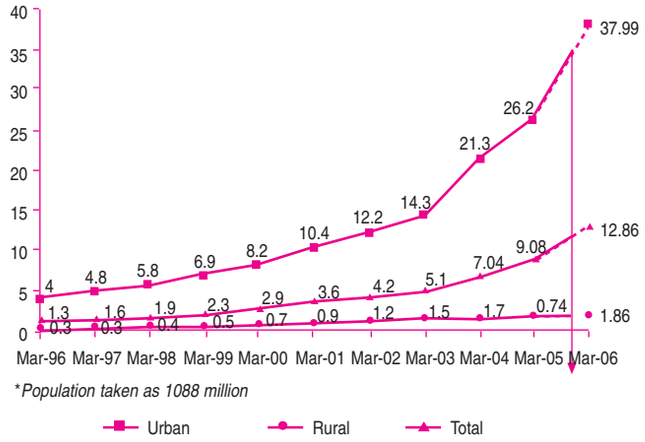

Fig. 4.1.2 Rural and Urban Tele-densities (1996–2006)

Source: TRAI (2005b and 2006).

Despite governmental concern for rural tele-connectivity and allocation of huge USO funds for rural telecom, there has been no substantial growth in rural areas and the rural growth curve pre- and post-liberalization looks remarkably flat (Figure 4.1.2). This is perhaps on account of the fact that mobile technology, the vehicle for growth in urban areas has not been introduced in rural areas. Competition in rural telecom is virtually non-existent and the government is the monopoly provider not unlike the 1948–98 scenario countrywide.

Evolution of the Telecom Sector: Lessons for Rural Telecom

Though manufacturing of telecom equipment by the private sector was permitted in 1984 and some services like radio paging were also opened for the private sector in 1992, the reform process only started after the issuance of the National Telecom Policy, 1994 (NTP 94), which called for bidding for private licenses and setting up of an independent regulator. However, the mere entry of private operators in the network did not help. The competition really started after a regulator was appointed in 1997 following the promulgation of the TRAI Act 1997 and it made effective interventions to create a level playing field for new entrants. The Regulator issued the first tariff order in 1999 and thus the reform process really started during the late 1990s. Some problems were identified in NTP 94 and in the implementation of TRAI Act, 1997. High Court also quashed the powers of TRAI to enforce interconnections. This led to the issuance of NTP 99 and amendments in the TRAI Act in 2000. Interconnection problems started again in 2004 by the Telecom Disputes Settlement and Appellate Tribunal (TDSAT) questioning these powers. These issues are now being debated before the TDSAT and the Supreme Court.

Prior to liberalization in the mid-1990s local calls, national long distance calls, and international calls were either managed by the government or by government companies and this network constituted a vertically integrated natural monopoly. Post-liberalization the network elements were effectively broken up and private players started building network elements leading to many competing public and private players.

The growth in the sector came in after the Government of India/TRAI made major changes in the policies, structure, and the regulation in the telecommunication sector. All stakeholders also responded positively. As can be seen from Figure 4.1.3, the Universal Service Objectives are affected by a number of policies and it would be necessary to analyse the implications of the same before implementing a plan to increase rural tele-density.

Even after the implementation of reforms, tele-density picked up slowly and increased from 1.94 per cent in 1998 to 5.11 per cent in 2003, that is, an average incremental growth of 0.6 per cent per year. The growth substantially picked up after 2003, when the regulator ceased to micromanage tariffs by replacing the cost-plus tariff regulation by competition regulation in urban areas. The regulator also substantially reduced interconnection charges and Access Deficit Charges (ADC). During this period, the government also substantially and continuously decreased revenue share. The changes led to drastic reductions in tariff to levels among the lowest in the world, despite higher taxation in India. Based on current monthly growth rates, over 5 per cent increase during 2006–7 can be expected. It would be worthwhile to look at the tele-density growth graph again and examine the growth engines during various phases and then examine the rural tele-density graphs for reasons of increasing divergence.

During 2003–6, 88 million mobile and 12 million fixed line telephones were added, and this addition too was basically wireless technology driven (Figures 4.1.4 and 4.1.5).

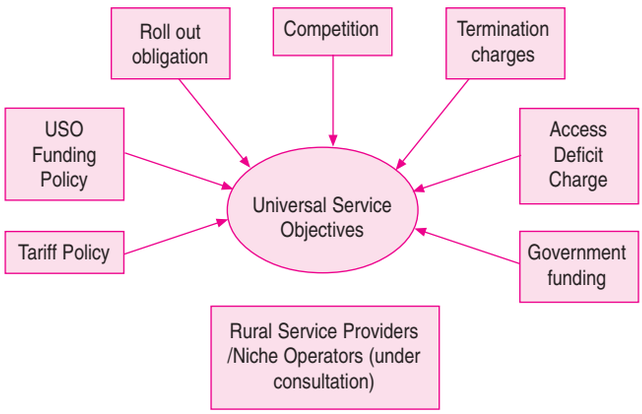

Fig. 4.1.3 Factors affecting Universal Service Objectives

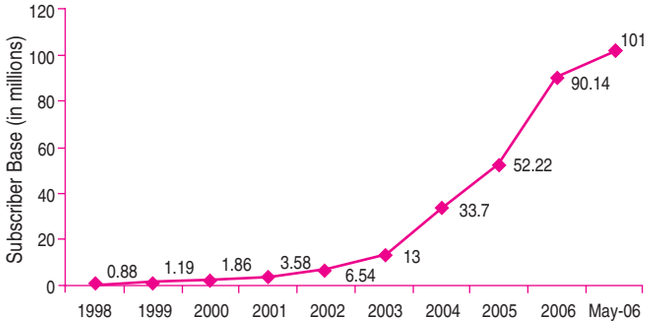

Fig. 4.1.4 Mobile Phone Growth

Source: TRAI (2005b and 2006).

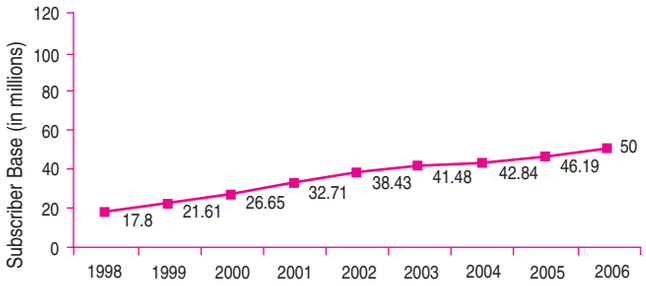

Fig. 4.1.5 Growth of Fixed line Telephone

Source: TRAI (2005b and 2006).

Private operators contributed prominently to post-1998 growth. Where public sector operators expanded their subscriber base in 1998–2006 by 32 million, the same for the private sector was 80 million subscribers. It is remarkable that public sector undertakings whose growth was very slow during the monopoly period of 1948 to 1998, that is, about 0.3 million subscribers every year, increased to about 5 million subscribers every year during the period 1998 to 2005. The public–private cooperation and competition led to immense improvement in the performance of both the public and private sectors (Figure 4.1.6). We can only infer from this that companies behave very differently in monopoly and competitive environments and consumers gain only when competition is introduced in markets.

The measures taken by TRAI to reduce tariffs-encouraging competition, introduction of Unified Access Licensing Regime, introduction of calling party pays regime, lowering of ADC from 30 per cent to 10 per cent of the sectoral revenue and later to 5 per cent, allowing cheaper handsets being sold at the time of delivery (with rest of the money charged in installments), allowing cheaper intra-network calls and fixation of very low termination charges, thereby increasing

Fig. 4.1.6 Subscriber Base of PSU and Private Sector Operators

Source: TRAI (2005b & 2006).

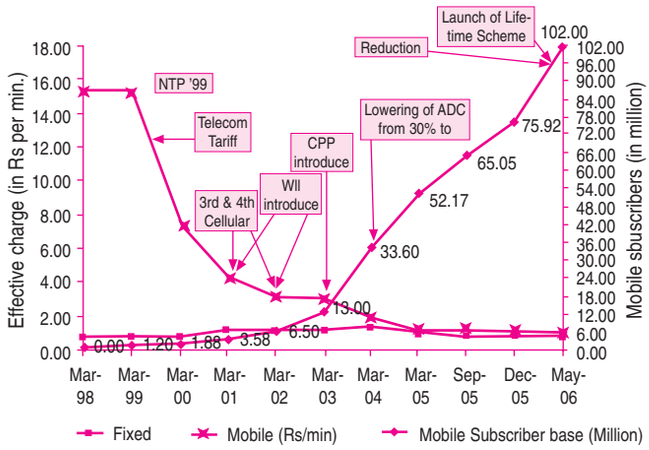

Fig. 4.1.7 Mobile Growth and Effective Charge per Minute

Source: TRAI (2005b and 2006).

competition at origination, a place where tariffs are fixed-led to the phenomenal growth (Figure 4.1.7). The government encouraged the process by changing high entry fee to revenue share and reducing the revenue share further in 2001, 2003, and 2005.

Despite a severe drop in tariffs, the income of telephone operators went up sharply due to the increase in the number of subscribers (Figure 4.1.8).

It was thought initially that reduction in revenue share would lead to severe contraction in government revenues. The introduction of service tax on telecom services in 1999–2000, however, led to a substantial increase in government revenues from mobile telephone despite severe reduction in tariffs (TRAI 2004). If we look at the total revenues from all telecom services they also increased exponentially after 2002–3 (Table 4.1.1).

There could be no better example of growth in revenue from lower taxation/tariff. But even today, the taxes and duties on telecom services are very high and need further reduction, particularly to universalize these services in real terms, which is now possible, and especially in rural areas. Despite very heavy taxation vis-à-vis other neighbouring countries, tariffs in India are the lowest in the world, a tribute to the competition in the sector and our operators (Table 4.1.2).

Fixation of very low termination rates in India has led to aggressive competition in origination, leading to the lowest call rates in the world (Table 4.1.3).

The analysis above clearly reveals that the factors leading to high telecom growth have been:

1. Introduction of mobile technology which allows telecom services to be offered at lower costs,
2. Healthy competition among large number of public/private operators,

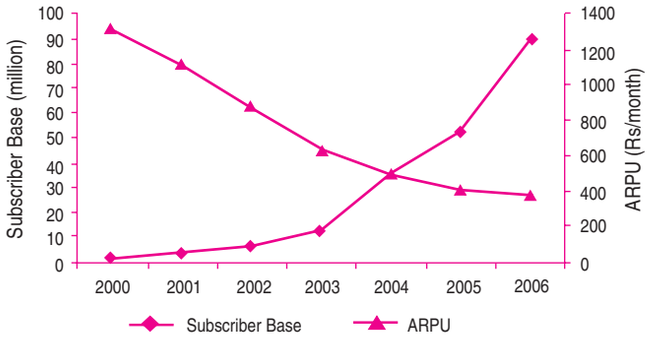

Fig. 4.1.8 Growth of Mobile Subscriber Base with Reducing Average Revenue per User (ARPU)

Source: TRAI (2005b and 2006).

3. The government and the regulator facilitating fall in tariffs by various measures including reduction in taxation and interconnection rates on the sector.

Internet and Broadband

The growth of internet and broadband in India has been tardy both in comparison to the growth of telephony as well as in comparison to some of our neighbours. The reasons are not far to seek. Mobile technology has kickstarted telephony growth. Internet/broadband in its traditional sense cannot be delivered through these networks. The entry price for these services is very high (because of the cost of a computer terminal), and like mobile telephony, internet, broadband tariffs were also very high in the initial years. Consequent to the Broadband

Table 4.1.1
Estimate of Government Levies from Licence Fee, Spectrum Fee and Service Tax on Telecom Services

(*Rs Crores*)

Year	Gross Revenue	Pass through	Adjusted Gross Revenue	Licence Fee *	Service Tax #	Spectrum Charge **	Total Govt. Levies
2002–3	48,000	7200	40,800	4080	2192	206	6478
2003–4	61,000	9150	51,850	4770	3024	434	8229
2004–5	72,000	15,549	56,451	5182	4470	711	10,363
2005–6	87,000	17,935	69,065	6264	5186	1409	12,859
2006–7	126,969	36,821	90,148	8176	8780	2344	19,301
2007–8	147,500	29,500	118,000	10,703	11,493	3304	25,500

Notes:* For telephone, cellular mobile, NLD, ILD, Internet service, varies from 0 to 15 per cent up to Dec 2005 and 0 to 10 per cent Jan'06 onwards.

Actual service tax collected has been taken from 2002–3 to 2005–6 and Service tax applied to Adjusted Gross Revenue for the other years as it is not charged on Interconnection Usage Charges, and so on. Service Tax rate for 2006–8 is 12.24 per cent.

** Spectrum charge varies from 2 per cent to 4 per cent depending on amount of allocated spectrum. Weighted Average Spectrum Fee for years 2002–3 to 2007–8 is estimated as 3 per cent, 3.4 per cent and 4 per cent respectively. Adjusted Gross Revenue from wireless service.

Source: Service providers' data and TRAI (unpublished information).

Table 4.1.2
Telecom Sector Levies in Pakistan, Sri Lanka, China, and India

	Pakistan	Sri Lanka	China	India
Sector Charges		Percentage of revenue		
Service Tax, GST	GST	VAT	3%	10% + GST
Licence Fee	0.5% + 0.5% R&D	0.3% of turnover (T.O.) + 1% of capital invested	Nil	5–10%
Spectrum Charges	Cost recovery	~ 1.1% of T.O.	~0.5%** (China Mobile)	2–6%*
USO	1.5%	Nil (only on ISD calls)	Nil	Included in license fees
Total Sector Charges	2.5% + GST + cost reovery	~1.3% T.O. + 1% inv + VAT	~0.5% + 3% (Tax)	17%~26% + GST

Notes:* Backbone spectrum charges extra.

** Estimated from spectrum fees & revenue of China Mobile.

Source: Information from Regulators website & TRAI.

Table 4.1.3
Call Charges per Minute of Use, ARPU and Termination Rates Per Minute for Mobile Service in Different Countries (June 2004)

Name of the country	Call charge per minute	Use/subscriber per month	ARPU (Average Revenue Per User)	Termination rates per minute	
				Fixed	Mobile
	US$	Minutes	US$	US$	US$
Australia	0.24	159	43	0.016	0.152
Brazil	0.11	92	11	0.020	0.080
China	0.04	261	10	0.010	0.025
Switzerland	0.45	119	59	0.017	0.163
Japan	0.33	156	63	0.022	0.130
India	0.04*	309	11	0.007	0.007

Note: *Has come down to 0.03 in 2005—lowest in the world—and going down further.

Source: TRAI 2004 & (2005b).

Table 4.1.4
Growth of Internet & Broadband and Tariffs (2003–2006)

	Mar-2003	Mar-2004	Mar-2005	Mar-2006
Internet Subscribers per hundred persons	0.4	0.45	0.51	0.63
Monthly charges for average usage of internet (in $)	–	9.5	5.0	4.6
Broadband Subscribers per hundred persons	0.019	0.02	0.03	0.09
Monthly charges for average usage of broadband (in $)	–	21	12	5.5

Source: TRAI (2006a).

Policy issued by the Government in 2004, and reduction in DLCC and IPLC tariffs enforced by the regulator, internet and broadband tariffs have declined and the services are now picking up (Table 4.1.4). However, since fixed line is almost a monopoly of the incumbent and last mile not unbundled, the absence of competitive multi-operator environment continues to retard the growth. Private operators mostly deliver broadband on cable TV circuits only and the monopoly last mile holder only provides broadband on 0.5 million lines in comparison to a resource of about 25 million lines with the incumbent, even assuming only 50 per cent lines to be broadband compatible. This is despite the fact that the government has been laying emphasis on broadband connectivity for several years now. The immense unfulfilled demand for broadband is made apparent by the fact that a much inferior service of dial up internet has acquired a large number of subscribers despite high tariffs. Unless broadband delivery is made competitive by last mile unbundling, take off will be slow as demonstrated by our experience with monopoly provisioning of voice services.

The presence of both public and private players in all these sectors and a framework allowing for maximum competition will open up the next phase of telecom revolution, including broadband and TV services. TRAI's recommendations in this regard were sent to the government on 13 January 2005 wherein it was recommended that a unified licensing regime should be introduced for all telecom services to encourage free growth of new applications and services.

Review of Rural Telecom Policies

Before liberalization, universal service objectives were met by the government through a series of programmes like Long Distance Public Telephone Programme (progressively increasing the scope to the provision of a public telephone within five kms of any habitation that is, one telephone in a hexagon of size five sq km), Gram Panchayat Phone (one phone in each gram panchayat), and Village Public Telephone Programme (one phone in each revenue village). In liberalizing the access segment, post-NTP (National Telecom Policy) 1994, specific VPT (village public telephone) roll out obligations were specified in the licenses. However, these commitments remained largely unmet. Most of the VPTs till date have been provided by BSNL. As on 31 March 2004, 5.22 lakh villages out of a total of 6.07 lakh had telephone access and of these 5.09 were provided by BSNL.

New Telecom Policy 1999 and the Universal Service Objectives

In 1999, the Government announced the New Telecom Policy that is, NTP 1999. Universal Service was one of the main objectives of NTP 1999. The policy outlined the following specific Universal Service targets:

1. Provide voice and low speed data service to the balance 2.9 lakh uncovered villages in the country by the year 2002.
2. Achieve Internet access to all district headquarters by the year 2000.
3. Achieve telephone on demand in urban and rural areas by 2002.

In addition NTP 1999 also set the following targets:

1. Make available telephone on demand by the year 2002 and sustain it thereafter so as to achieve an all India tele-density of 7 per cent by the year 2005 and 15 per cent by the year 2010.
2. Encourage development of telecom in rural areas through suitable tariff structure and by making rural communication mandatory for all fixed service providers.
3. Increase rural tele-density from the current level of 0.4 to 4 by the year 2010 and provide reliable transmission media in all rural areas.
4. Achieve telecom coverage of all villages in the country and provide reliable media to all exchanges by the year 2002.

The NTP 99 and the consequent creation of the Universal Service Obligations Fund led to the development of a policy and regulatory framework for managing Rural Telecom Services (RTS). The targets set by NTP 1999 and the achievements till March 2004 show that there is an excellent progress in all areas except rural connectivity (Table 4.1.5). The targets for overall voice connectivity by 2010 would be overachieved by a wide margin.

In 2002, USO Fund was established to fund specific USO targets set by NTP 99. In addition, open competition was introduced to create pressure on service providers to expand coverage and to reduce subsidies. This resulted in steep reduction in mobile and long distance tariffs and increased

Table 4.1.5
NTP 1999 Targets, Achievements, and Shortfalls

NTP 1999 Targets	Eligibility for USO Funding (NTP 1999)	Achievement (March 2004)
Provide voice and low speed data service to the balance 2.9 lakh uncovered villages in the country by the year 2002	Yes	5.22 out of 6.07 lakh
Achieve Internet access to all district headquarters by the year 2000	Yes	Achieved
Achieve telephone on demand in urban and rural areas by 2002	Yes	Urban demand largely met, Rural unmet
Teledensity of 7 by the year 2005 and 15 by the year 2010	No	Tele-density 7 achieved in March 2004, and 15 likely by Dec 2006
Rural teledensity from the current level of 0.4 to 4 by the year 2010	Partly	Rural Tele-density 1.7 in March 2004
Reliable media to all exchanges by the year 2002	No	30000 out of 35000 exchanges on fibre and several on microwave and satellite
High-speed data and multimedia capability using technologies including ISDN to all towns with a population greater than 2 lakh by the year 2002.	No	NA

Note: NA: not available.
Source: Compiled by author.

choices for consumers. However, concerns regarding slowing down of VPT/Rural Direct Exchange Lines (DELs) roll out have arisen. The yearly increments in VPTs/Rural DELs indicated below confirm the deceleration despite adequate availability of funds (Figures 4.1.9 and 4.1.10).

The prime reason is apparently the increased focus on cellular mobile infrastructure deployment after 2001–2 by all operators at the cost of fixed line and rural investments due to very high per capita costs of providing fixed line connectivity. Also, a large number of rural DELs installed by BSNL, based on Multi Access Radio Relay (MARR) technology did not work and had to be replaced at government cost. Since the present dispensation only adds one or two telephones in a village, the maintenance arrangements are inefficient, putting the entire roll out programme in jeopardy. The bustle of the cellular market has almost completely by-passed the rural client because the government does not support mobile telephony through USO fund for rural areas in a focused and targetted fashion.

USO Fund and Amendment in the Indian Telegraph Act 1885

On 9 January 2004, the Indian Telegraph Act 1885 was amended to provide the USO Fund (USOF) a statutory non-lapsable status. The Act states, 'Universal Service Obligation' means the obligation to provide access to basic[2] telegraph

[2]This was interpreted to mean service provision through fixed and fixed wireless technologies. The government has amended the Act to include mobile services in rural areas (see Chapter 1 of this report).

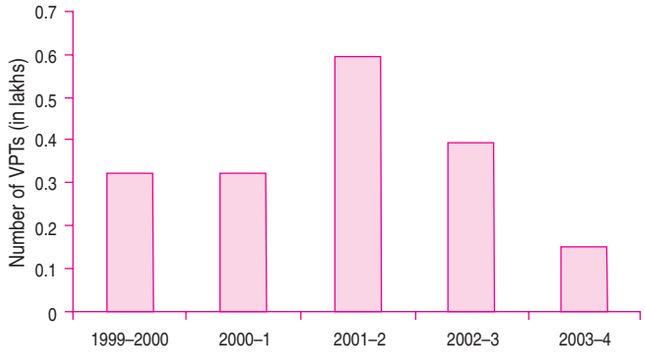

Fig. 4.1.9 Yearly VPT Additions

Source: TRAI (2004).

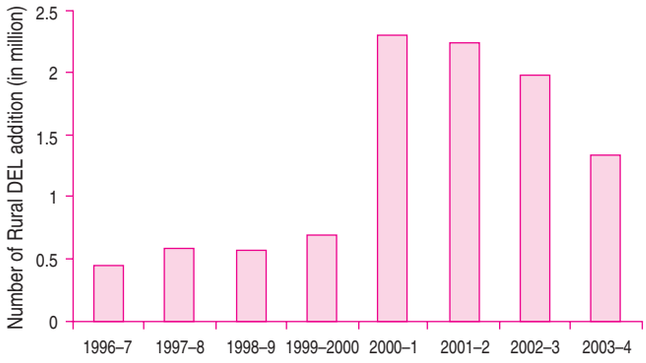

Fig. 4.1.10 Yearly Rural DELs Additions (in millions)

Source: TRAI (2004).

services to people in rural and remote areas at affordable and reasonable prices'. The USO levy is presently 5 per cent of AGR and comes out of the license fees paid to the government. The implementation of USO is through a multi-layered bidding process. The Fund is being administered by the Department of Telecom through Universal Service Fund Administrator, an establishment set up by the government in 2004. Though the fund is non-lapsable, the proceeds are credited to the Consolidated Fund of India and can only be withdrawn through the budgetary process, that is, after the expenditure every year is approved as a part of the budget. Thus control of the fund lies with the Ministry of Finance and the details of the scheme are controlled by the USOF Administrator.

Until recently as per prevailing policy, USOF did not subsidize mobile services making it difficult for service providers to take such networks to rural areas on their own. Consequently, prohibitively expensive fixed lines were laid in rural areas. These were then heavily subsidized through USOF to enable service providers to offer low rates to customers. This practice has been replaced by a policy which encourages low cost mobile technology to enter rural areas through a subsidization plan for service providers that is much more viable than what is presently incurred in terms of subsidy costs. TRAI had recommended strategies that clearly demonstrated that minor tweaking of the policy provisions could prevent subsidies from flowing into unviable phones. One or two phones subsidized in an entire village in the absence of a developed telecom market in a village would not change anything. We would also lose the opportunity to create a much more viable telecom market where the villager would no longer complain: 'why should I buy a telephone? I cannot talk to anyone in a village. All other phones are only public call offices'.

Present Status of USO Fund Receipts and Disbursements

Around Rs 500 crore have been disbursed to telecom service providers during the two financial years, 2002–3 and 2003–4, and Rs 1315 crore in 2004–5 to provide telecom services in rural/remote areas. These services mainly include maintenance of existing VPTs, replacement of VPTs working earlier with MARR technology (which did not work and had to be replaced at government cost) and subsidy to existing rural DELs. Telecom operators contributed 5 per cent of their adjusted gross revenue to the USOF.

Minimizing the Cost of Increasing Penetration of Telecom Services in Rural Areas

The government had finalized the guidelines which provide that the following activities will be supported by the USOF, namely:

Table 4.1.6
Collection and Disbursement of USOF (Rs crore)

Financial Year	Collection	Disbursement	Balance
2002–3	1654	300	1354
2003–4	2143	200	3297
2004–5	3458	1315	5440
Total	7255	1815	5440
2005–10(est.)	37541	17937	25044

Source: Information received from office of USOF, DoT.

1. Operation and maintenance of village public telephones (VPTs).
2. Provision of additional village community telephones in villages with a population above 2000, after achieving the target of one VPT in every village.
3. Replacement of MARR based VPTs installed before 2002 which did not work.
4. Upgradation of a public telephone to Public Telecom and Information Centres (PTICs) in villages with a population of more than 2,000, for providing data application including FAX, email, internet besides voice telephony.
5. Installation of high speed PTICs for providing additional facilities including tele-education and tele-medicine at block headquarters and in villages with a population exceeding 2000.

The amount of support from USOF for the above mentioned activities excluding rural DELs will be around Rs 3300 crore for the commitment period ranging from five to seven years for Rural Community Phones and VPTs in uncovered villages and for existing VPTs including MARR replacements. The balances in USO fund can allow the Government to take up more activities and if the USO is extended to mobile infrastructure, as recommended by TRAI, mobile telephony in villages can yield dramatic results.

Even with the current collections and disbursals from the USOF, the targets of NTP 99 can be barely met. Therefore, an alternative is to examine the provision of USOF support for network infrastructure providers as well as mobile infrastructure providers (Jain, 2006). The USOF provides support for rural DELs in 1685 net high cost SDCAs. It is estimated that 6.6 million additional rural DELs will be installed in these 1685 SDCAs by the year 2007, which will be eligible for support from the USOF. The amount of support from USOF for the new rural DELs beyond 31.3.2005 was around Rs 11,000 crore for the period of commitment (Tables A4.1.1 and A4.1.2).

An additional amount of around Rs 2600 crore is likely to be required for upgrading the DELs which were installed in these SDCAs from April 2002 to March 2005. Besides these 6.6 million DELs in 1685 SDCAs, some additional rural DELs

will also get installed in the remaining SDCAs by the year 2008. Thus, including the existing 13.6 million rural DELs, the rural tele-density may still not reach the 4 per cent target by the year 2010, after providing a subsidy (including VPTs) of around Rs 17,000 crore. In fact, if all rural DELs installed after 31.3.2002 are provided USOF support so as to reach a target of 4 per cent rural tele-density by 2010, then the total support amount including support for VPTs and so on would be around Rs 25,000 crore (Table A4.1.3).

It needs to be pointed out that rural DELs have been receiving support from ADC since 2003 which will conclude and merge with USOF in 2008. The rural DELs will get a further subsidy of around Rs 5000 crore from USOF beyond 2008, if the present approach of USOF subsidy to fixed line DELs continues. Rural areas cannot be expected to live with such low tele-densities and that too, at such high subsidy cost particularly, when it is possible to substantially increase tele-densities in rural areas with the help of new technologies and regulatory regimes in line with urban areas.

Barriers to Penetration of Telecom in Rural Areas

Network Coverage

We can now examine the reasons why the telecom revolution failed in rural areas. Mobile technology, the primary factor in the rapid increase in urban tele-density, is not supported in rural areas by adequate Base Transceiver Station (BTS) infrastructure (towers, power supply, and so on). In 2003–4, mobile networks covered mere 1700 of the 5200 towns in India and hardly any villages. The total population of subscribers catered to by these networks came to 200 million, all urban. The number of rural subscribers was negligible (TRAI 2004).

Since the mobile tariffs have decreased considerably, there is a huge demand for mobile telephones in rural areas but unless mast heads cover rural areas this demand will remain unmet. TRAI (2005a) discussed the coverage aspect with mobile operators and the operators agreed to launch a telecom expansion plan as given in Table 4.1.7.

However, the implementation of the plan has thus far been adequate only in the densely populated and hence, more profitable urban areas. If government policies are implemented through USOF subsidies to ensure competitive rural coverage of mobile network, rural tele-densities can start approaching urban levels. Also if these networks can deliver multiple services, their economy would further improve.

Doubts have often been raised regarding the existence of a commercial market for mobile phones in rural areas. However, international case studies on comparative mobile tower coverage in similar countries suggest that the market does exist and such coverage is eminently practicable. In consultation with the operators TRAI suggested a population coverage target of 75 per cent by the end of 2006. Later experience showed that this figure is not easy to reach and requires incentives to be given by the Government and policy change viz. making mobile infrastructure subsidy eligible for USO, encouraging the sharing of towers and so on.

It is probable that the present average revenue per user (ARPU) of Rs 322 per month (approximately $7) in the telecom sector will go down further if the operators enter rural areas. Research tells us that Indian cellular operators can remain profitable even at an ARPU of $4 per month (Morgan Stanley, 2005). Hence, operators can profitably expand into non-covered and rural areas. In any case, operators are already offering some tariff packages that assure ARPU of over $4 per month. The recent policy initiative regarding subsidizing mobile phone operators' networks needs to be aggressively implemented.

Table 4.1.7
Proposed Network Coverage by End 2006; Operators' Plan

	By area	Population Coverage (~75 per cent)
Towns	~4900 out of 5200	~300 Million
Rural areas	~350,000 out of 607,000 villages	~450 Million

Source: TRAI's IUC Regulation dated 06.01.2005.

Table 4.1.8
Mobile Coverage in Selected Countries, by region, 2002

Region	Country	Pop. Covered by mobile signal
Africa	Cape Verde	90%
	South Africa	93%
	Togo	90%
	Zambia	50%
Americas	El Salvador	85%
	Ecuador	86%
	Guatemala	68%
	Mexico	90%
Arab States	Jordan	90%
	Morocco	95%
Asia-Pacific	Korea Rep.	99%
	Malaysia	95%
	Philippines	70%
	India	20%
Europe	Azerbaijan	94%
	Belarus	72%
	Czech Republic	99%
	Slovak Rep.	98%

Source: ITU World Telecommunication Indicators Database.

Backbone Infrastructure

Currently around 670,000 route kilometers of optical fibre is laid across India. Of the 35,000 exchanges in the country, 30,000 exchanges of the incumbent have OFC (optical fibre cable) connectivity (these include OFC connectivity of about 27,000 exchanges in rural areas). In addition, satellite systems offer high bandwidth connectivity all across India through VSAT. In spite of the existence of this nationwide fibre network adequate connectivity to villages is not available to an entrepreneur other than the facility owners (which is the BSNL). The cost of installing backbone infrastructure in semi-urban and rural areas for a new entrepreneur can be substantial, and it is in the interests of economic efficiency that the existing infrastructure be fully utilized. The problem is that the facility owners are not willing to share their infrastructure commercially with the private operators.

The only additional capacity available is that with infrastructure service providers (IP-1 & IP-2). The World Bank study in this regard has identified that the capacities available in the country are quite substantial (TRAI 2005a). In actual practice, last mile connectivity sometimes seems to be the limitation. In addition, there are no uniform, clear, applicable, and enforceable guidelines for various procedures such as right of way, municipal and civic clearances and so on. As a result, different state governments adopt different rules, criteria, costs and time frames, which have significant time and cost implications for the operators in obtaining requisite clearances.

Infrastructure Sharing

According to industry estimate, setting up a cellular tower (BTS) costs around Rs 50 lakh inclusive of equipment, power plant and so on (TRAI 2004). A significant number of existing cell sites is already being shared by competing operators across the country mainly in urban areas. In rural areas, too, sharing infrastructure will reduce costs and the advantages may be substantial, depending on how win-win deals are struck by operators. The incumbent and the owner of majority of the rural infrastructure does not wish to give up its first mover advantage by sharing infrastructure. However, other operators who have experienced the advantages of sharing of infrastructure in urban areas are quite keen on the arrangement. The choices range from voluntary sharing to government/TRAI mandated sharing of infrastructure. If it is mandatory sharing, it follows that TRAI must fix rates on forward looking long run increment cost principles, universally adopted by network regulators to ensure growth.

It is a matter of deep embarrassment for the government that in Andhra Pradesh, the incumbent is charging such usurious rents that the laid fibre remains dark and operators are forced to lay alternate fibre or try alternate modes of delivery. The huge rural demand for knowledge based networks remains unfulfilled. The incumbent has nothing to lose from poor capacity utilization of its network, because it is subsidized by USO funds or ADC or license fee waiver. Consequently, a network laid at the expense of the taxpayers' money in the name of rural connectivity remains unutilized. It must be ensured through policy or regulatory intervention that these networks are effectively utilized.

Tapping Effective Demand for Rural Telecom Services: Purchasing Power is not a Barrier

A demand side analysis will help to differentiate the areas where services may be provided in a commercially viable way from those where support will be required to enable provision. The increasing purchasing power of rural Indians (Tables 4.1.9 and 4.1.10) and a similarity in the purchase basket with those of urban areas increasingly indicates an ability to purchase telecom services and the low rural tele-density in some areas may indicate supply side constraints. (For statewise analysis, please see Part II of Chapter 4.)

Subscribers buy telephones when they can afford it. If we look at tele-density in India and in other countries with similar Gross National Income (GNI) per capita on purchasing power parity (PPP) basis, it appears that India can also increase its tele-density very fast based only on income indicators (Table 4.1.9).

It is interesting to note that while in percentage terms, the middle to high income households in rural areas are nearly one-third of those of urban areas, in absolute terms these numbers are almost the same. Further, in the lower middle-income group also, while the percentage of rural households is just a shade higher than urban households, in absolute terms, these constitute nearly two and a half times the number in urban areas.

The cost-effectiveness of a given solution in providing communication service in rural areas because of the spread out characteristic of the subscriber base is a different consideration and may require subsidization of the network

Table 4.1.9
Urban/Rural Income-wise Distribution of Households in 1998–99

(in millions)

Income Group	Rural Households	Urban Households
Lower	58.87 (47.94%)	9.31 (18.96%)
Lower Middle	42.77 (34.83%)	16.58 (33.76%)
Middle to High	21.16 (17.23%)	23.22 (47.28%)
Total	122.81 (100%)	49.11 (100%)

Source: NCAER IMDR 2002.

in rural areas. Any subsidization of individual telephones may not be an appropriate policy, in view of the huge rural demand and inevitable problems in implementing micro-managed subsidization policies.

India's rural market has been growing steadily over the years and is now bigger than the urban market for FMCG (53 per cent share of the total market). Rural India also accounts for a large pie of consumer durables/white goods, automobile/two-wheeler/tractor sales among a host of other industry sectors in our country. Table 4.1.10 presents the ownership pattern of key durables.

According to the World Bank, 'wherever they are given the choice, poor communities often spend on communications as much as urban communities, in terms of percentage of available income' (World Bank, 2002). With wide network coverage and affordable communication services, rural growth can pick up substantially in a short time frame and this opens the Universal Service Opportunity window, both for the operators as well as subscribers.

The demand for mobile telephones is increasing very fast even in small towns. Category C states have, on average, 85 per cent rural population, while Category A and B consist of 67 per cent and 75 per cent rural population respectively. Further, Category C states, which include Himachal Pradesh, Bihar and Jharkhand, Orissa, Assam, Sikkim, Tripura, Meghalaya, Manipur, Mizoram, Nagaland, Arunachal Pradesh, and Jammu & Kashmir, have on average lower per capita income than states in other categories—approximately Rs 8000 as compared to Rs 10,000 and Rs 13,000 for B and A category states respectively. Yet, Category C circles have outperformed the national and other Category averages in percentage growth over multiple quarters, in terms of both GSM and CDMA subscribers (albeit on smaller base). Consequently, we can contest the claim that areas with higher rural populations or lower economic status are not attractive for investment in telecommunications infrastructure.

Since the demand for goods in rural areas has grown several folds in recent years, our policies should now concentrate on expanding the supply of telecommunication services to rural areas. The government should substantially compensate such infrastructure from USO funds to facilitate explosive rural growth in telecom. Schemes should be simple and free from bureaucratic intervention if one is serious about replicating the urban growth model in a time bound manner.

There is another feature of the Indian telecom market that characterizes the consumer profile very distinctly. Unlike other countries, where fixed line telephones far outstrip cable TV connections, the growth of cable TV services in India has been remarkable (Table 4.1.11).

The remarkable growth in cable TV which has connected more houses by wire without any government support, allocation or subsidy, vis-à-vis fixed line telephony where far fewer houses have been connected despite huge demand as indicated by long waiting lists, clearly shows:

1. Whenever the Indian government has allowed entrepreneurs free choices with non-draconian regulation, providing an environment for the expansion of business, they have flourished (Jain, 2001).
2. Indian consumers value multi-sourced information (here, cable channels in addition to Doordarshan) and entertainment (Star plus, Sony, Zee TV, and so on) much

Table 4.1.10
Urban-Rural Markets

				Total numbers in millions	
	All India	Urban + Semi-urban	Rural	Urban + Semi-Urban	Rural
Total Households (millions)	192	54	138		
Bicycle		24.84	59.34	46	43
Radios		23.76	44.16	44	32
Television		34.56	26.22	64	19
Motor Cycles & Scooters		13.5	9.66	25	7

Source: TRAI's study paper on Indicators for Telecom Growth dated 30.06.2005c (TRAI, 2005b).

Table 4.1.11
Number of Cable Subscribers and Number of Fixed Line Telephone Subscribers (2003)

(In millions)

Name of the country	No. of cable TV + DTH subscribers	No. of fixed line connections
Australia	1.55	10.82
China	105.00	263.00
United Kingdom	10.50	34.90
Japan	8.10	71.15
Korea	11.94	22.88
Taiwan	5.30	13.36
Thailand	0.43	6.60
United States	94.97	181.6
India	61*	47*

Note: *Data for India is for 2005.
Source: TRAI study paper on Indicators for Telecom Growth dated 30.06.2005 (TRAI, 2005b).

more than fixed line telephone services. This trend is not the same anywhere else in the world, as shown in the table above. The popularity of cable TV should be leveraged to increase the penetration of communication services, particularly in remote and rural areas. This can be incentivised by encouraging rural triple (or more) play networks. Such IP based next generation networks in place of present switch based networks are already being implemented in many countries. The operators can be allowed this choice if a converged network is introduced into the Indian telecom sector. Such an environment can be enabled either through Convergence Bill (if it is passed by the Parliament) or Unified Licensing (Unified Access Licensing introduced already).

Once the rural areas get adequately connected, their untapped energies may be released to produce results we cannot even anticipate today. This has been convincingly demonstrated by the efforts of pioneers such as ITC, N-Logue, and Akshaya, and the experiences of the Indian IT industry, and the experiences in urban voice networks. The isolated cases of successful rural centres in Kerala, AP, Tamil Nadu, and Karnataka need to be replicated in a time bound manner to make a serious difference to the rural economy.

IT Application in Rural Areas: Some Initiatives

Indian corporate, state governments, and NGOs have launched several rural initiatives of different scales based on the latest ICTs. The results throw new light on the rural telecommunications scenario in terms of demand for services, possible modes of supply, and financial viability of initiatives. The types of services provided by the pilot projects through private initiative in rural areas of India can be classified as follows:

1. Profit Driven Projects:
   (a) ITC e-chaupal
   (b) N-Logue
   (c) Drishtee (using existing telecom infrastructure)
2. Grant/aid Supported Projects:
   (a) MS Swaminathan Center (in Pondicherry, focused on agriculture and fishing applications).
   (b) Tara-haat (focus on rural enterprises).
   (c) Akshaya (in Kerala with Government support).
   (d) Gyandoot (in M.P. with focus on e-Governance) operated by N-Logue.
   (e) Rural e-Seva (in East Godavari District of AP with focus on e-Governance).
   (f) Warana Village (in Maharashtra by NIC) operated by N-Logue.
3. Application Development initiatives:
   (a) Bhoomi
   (b) Lokvani
4. Infrastructure Enhancing State Government Projects:
   (a) Andhra Pradesh Broadband Network: Broadband connectivity available across the state for offices, institutions, and homes at affordable costs (Jain, 2004).

The list of such projects is expanding and all may not have been captured above. But there is a lesson in these projects for all of us that, recognizing the benefits of rural connectivity, corporate, educational institutions, NGOs, and State governments have launched major projects which cover thousands of villages and if these efforts could be integrated into an appropriate policy framework, there would be an explosive increase in rural connectivity/communications, the kind of which has never been witnessed in India before.

We enumerate here four projects, namely, Lokvani, e-Chaupal, N-Logue and Andhra Pradesh Broadband Network which have used different communication platforms. Policies to promote commercialization can draw from the experiences with all the platforms.

Lokvani

Lokvani is an e-Governance programme based on PCO network, to improve governance in districts. There are four important features of the programme. First, it uses PPP model to improve governance at the district level. Second, it uses existing PCO network. Third, the network uses software provided by NIC which can be scaled up in other districts. Fourth, deepening of services through Lokvani has been demonstrated (Box 4.1.1).

ITC e-Chaupal

Based on V-SAT technology, ITC has covered over 25,000 villages with e-Chaupal at 4300 places in six states where information about ITC's agricultural products, market, weather, fertilizer requirements and their variety is provided (Box 4.1.2).

These e-Chaupals, besides providing connectivity and information, also serve as ITC ground level outlets for agricultural products. Products such as seeds and fertilizers of guaranteed quality are made available at reasonable rates. These chaupals also carry out other commercial transactions with farmers such as purchase of agricultural produce, thereby, eliminating the village middle men. The scheme has received very positive response from villages since the villager is now able to get better price for his crops in a transparent manner and is assured of the quality and quantity of inputs that he may purchase.[3] He has the option of choosing the time of sale based on market information. These services have led to a communication revolution at the village level. By careful planning, these networks can be used for other applications including e-governance, e-health, e-education and so on.

[3]This is assured by ITC employed area managers.

Box 4.1.1

LOKVANI—People's Voice

Amod Kumar, Markanday Shahi, and A.P.Singh

Lokvani is an e-governance programme launched in public–private partnership with the combined efforts of both, the district administration as well as the National Informatics Centre in the district of Sitapur (UP) which is home to 3.6 million citizens of whom 88 per cent are rural inhabitants with a 38.86 per cent literacy rate. Lokvani is an outstanding example of a highly cost-efficient, economically self-reliant, user financed community network. It has been projected as a commitment to the people in providing them with transparent, credible, and accountable systems of governance. This system is grounded in the rule of law, encompassing civil, political, as well as economic and social rights underpinned by accountable and efficient public administration for multiphase development of the rural people. The primary objective of the IT solution is to bridge the *digital divide* and 'connect' the common man to the strategy makers in a seamless fashion.

The Lokvani model has been formulated keeping in mind the three key stakeholders: (a) government; (b) the IT entrepreneurs/ Kiosk operators; and (c) the citizens. Since the IT literacy (and also any form of literacy) is very low in Sitapur, the Kiosks form an interface between the IT enabled government and the IT illiterate citizens.

Government

A society by the name of *Lokvani* was constituted at the district level to implement the project autonomously and reduce some of the bureaucratic pressures. All the financial decisions were taken under the purview of the society itself. The rationale for such a framework is that the budgets of small districts have a limited scope for extra expenditure and the process of getting finance is a long drawn out and complicated one. The *Lokvani* society meets its recurring expenses from the money received from the registration of Kiosks and short term and lifetime membership fees. The initial costs for setting up the society were also negligible as the hosting services was provided free of cost by the National Informatics Centre.

IT Entrepreneurs/Kiosk Owners

In the Lokvani system, Kiosk centres are set up in the existing cyber cafes and computer training institutes. This has ensured the financial viability and long-term sustainability of the Kiosks due to an alternate source of stable income. This step ensured that supplementary capital was not vital to the solution. The society signed contracts with existing Kiosk owners for the purpose of registering them as Lokvani franchisees with only a nominal annual fee of Rs 1000. IT entrepreneurs run the Kiosks. A typical Kiosk has an internet enabled PC, a printer and a webcam. It also has a CD ROM drive. Some Kiosks also have a power backup (typically, power is available five hours a day).

Kiosks earn profits from various services of *Lokvani* provided to the citizens. In addition, the Kiosks can also generate some extra revenue by providing disparate facilities like computer education, computer typing, digital photography, internet access resulting in cross sales.

Citizens

The citizens form the customer base for which the model has been designed. The citizens save tremendous cost and effort in obtaining government services, registering grievances and petitions, accessing land records, seeking employment opportunities or learning about governmental schemes and services through the Lokvani facilities. In an economy riddled with poverty, it is an enormous burden on the citizens to forego daily wages to obtain regular government services. Therefore, with the Lokvani system, the citizens are the key beneficiaries and the media is putting pressure on the government to ensure the continuation of the system (Figure B4.1.1).

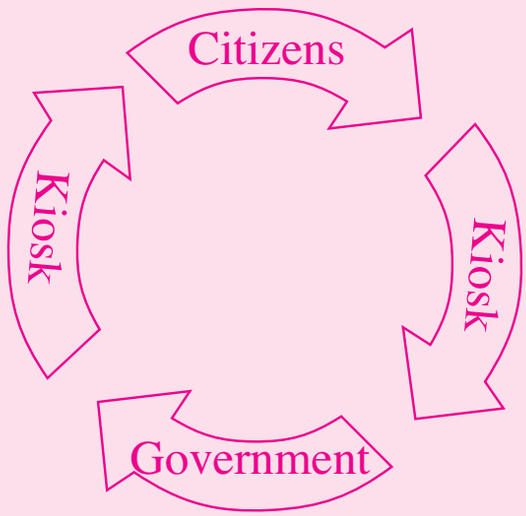

Figure B4.1.1: Operational Model of Lokvani

Geographical Spread

There are forty-two uniformly distributed kiosk centres at the block and tehsil level of Sitapur. Each black dot in that figure represents the location of a Kiosk centre in Sitapur. More than one Kiosk may be situated in the same place.

Services Offered by Lokvani

The *Lokvani* system has empowered the public by generating awareness about citizens' rights through a seamless flow of information. It is an outstanding manifestation of the 'right to information'. The services offered by *Lokvani* encompass a wide

range of government departments (Department of Public Grievances, District Administration, Development Department, and Department of Land and Revenue). The services offered by *Lokvani* are (a) Grievance and Petitions, (b) land records, (c) tender service, (d) employment services, (e) information related to government schemes, and (f) information about government services.

Lokvani Grievance and Petitions Service

This is the most popularly used service of the *Lokvani* system as of now. This service allows citizens to register and then track the status of their petition via a local kiosk. The complaint is then transferred to designated officials, who can read but cannot modify it. It has many unique features including one which enables the citizens to follow up on their complaint while on the move with the help of a mobile phone.

Another salient feature is the colour coding of complaints to ensure a prompt and satisfactory reply. It begins with the complaints being coded white which automatically transforms into yellow 4 days before the set deadline for the disposal of the complaint. Lastly, in the event of the expiration of the deadline, they are coded red otherwise the complaints are coded green and disposed of.

Various functionalities provided are Status of Complaint, Officerwise Summary of all Complaints, Summary of all Complaints, Datewise Received Complaints, Centrewise Sent Complaints, Datewise Marked Complaints, Datewise Modified Complaints, and Datewise Disposed Complaints.

Land Record System

Information about the type of land, list of villages and details regarding the allotment of land in villages are available online in the local language. Individuals can view the land records for a nominal payment. In case the information regarding a particular land record is not available online at the kiosk centre, the applicant gets to receive it within a stipulated period of five days by speed post.

Tender Services

Notices regarding the tenders and their terms and conditions are published under the *Lokvani* Tender Service. The forms are also available for download. Interested contractors can send the completed tender forms through speed post to the concerned offices. Results and comparative charts of all bids are displayed on Internet within 24 hours of allotment.

Employment Services

The *Lokvani* system provides information on all vacancies in the district as well as downloadable application forms for job seekers. Detailed information regarding the financial help provided by the government under various self-employment schemes is also available.

Information relating to Government Schemes

The data of various schemes funded by the Central and State Governments through various Developments and Social Welfare Departments is accessible via Lokvani. Application forms for social schemes like Old Age Pension Scheme, National Family Benefit Scheme, Professional and Vocational Education, Loan for the Physically Handicapped, Loan for the Development of Small Scale/Handicraft/Cottage industry are made available for download. Citizens can download these forms and submit them through traditional methods.

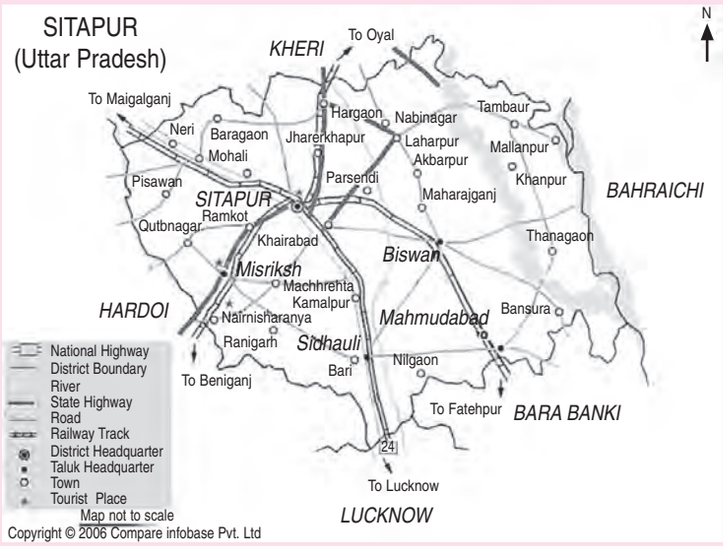

Fig. B4.1.2 Lokvani Kiosks with Black Dots representing the Kiosk location

Information about Development Works

Lokvani provides a list of developmental programmes which are running under various departments like Educational Department, Jal Nigam, Electricity Department, Food and Civil Supply Department, Social Welfare Department, Public Works Department, Revenue Department, and other development departments. It also provides information about the people who have received employment under the National Food for Work Scheme and allotees of homes under the Indira Awas Yojana. Information on the development work under various schemes like National Food for Work Scheme, Member

of Parliament Development Scheme, and Member of Legislative Assembly Development Scheme is also available online. Detailed information about the food allocated to Kotedars and other agencies is also freely available.

Single Window System

Lokvani Single window system deals with the filing of application for Birth, Death, Income, and Domicile Certificates at the kiosk centers. These certificates are received after due completion of the verification process. The system has been introduced on a trial run basis.

Benefits of the Lokvani system

Citizens can easily obtain pertinent information from the kiosks that are conveniently located in every block and even in a few villages. Unlike the traditional method, people are not required to visit the district/tehsil headquarters and as a result save on precious time, money, and effort.

Computerization of land records has precluded the dependence on the Lekhpal for furnishing the official documents. Citizens can access information about various government schemes and their preconditions through kiosks. They can also obtain the list of persons who are benefiting under various schemes. A complaint can be filed against the concerned officer in the case of any discrepancy. For example, if a person benefiting from the Food for Work, Indira Awas Yojana, Mid Day Meal or Prime Minister Gram Sadak Yojana does not fulfil the prescribed criteria specified by the government, anyone can file a complaint against him. Online tender services have significantly reduced the preexisting monopoly of some influential contractors. Results and comparative charts of all bids are displayed on *Lokvani* within 24 hours of the allotment. This has drastically reduced the likelihood of illegal negotiations after the allocation of a tender.

Before the implementation of *Lokvani*, there existed no easy method of checking the time taken by an officer to resolve cases assigned to him, thus promoting a culture of lackadaisical approach and dereliction in solving problems. However, in the new system, the officer is assigned a reasonable time period within which he has to redress the issue. This strict schedule has dramatically increased the efficiency and accountability of officers. Moreover, the District Magistrate and the citizens can access the progress report of the work by any officer. Transparency brought about by the easy availability of information on land records has reduced the possibility of land scams.

Kiosk operators are earning extra money besides their regular income, without any extra investment. This has caused the number of registrations to climb up drastically. Apart from this their earnings from their mainstream business has also gone up.

Recently, Court Information System has been added to the portal. There is a plan to include:

- Online Electoral Rolls,
- Vehicle Registration, Driving Licence,
- Payment of electricity bills, phone bills,
- Ration cards and allotment to Kotedar,
- Police thana computerization/networking connectivity,
- Tourist Related information,
- Daily rates of Fruits/Vegetables/Grains,
- Online pensioners' information/Installation of IVRS—SMS,
- Parivar register Database (Rural and Urban),
- All Employees Database,
- University/College information (seat availability, admission),
- Health information (All Hospitals/Nursing Homes/Laboratories),
- Recovery Certificates (R.Cs),
- Industries information (Durry exporters and so on),
- Registry of properties,
- Banking Services,
- Drinking Water facilities Database,
- Development from MP/MLA funds,
- Khasra and Jamabandi records, and
- SC/ST tracker to Lokvani services.

In short, with the deployment of Information and Communication Technology, the task of managing the services becomes effortless. Prior to the *Lokvani* system the infrastructure was abysmally inadequate due to a very limited number of computer systems and non-existential computer networks. Another factor contributing to the efficiencies in governance has been the ability of the administration to effectively monitor the government officers.

Note: The views expressed here are those of the authors of the box.

Box 4.1.2
Building Rural Market Infrastructure

Rajasekhar

ITC's e-Chaupal was designed to achieve convergence between enhancing shareholder value, social good, and stimulating sustainable rural development based on community-centric and market driven principles. It addresses issues contextualized within the Indian farming and village systems by bringing to bear specialized expertise and insights required for scalable solutions.

The geographical dispersion of farmers increases the complexity of their market linkages. Weakness in physical infrastructure, in combination with weakness in institutional infrastructure, leads to multiplication of intermediaries in the value chain. One of the objectives of e-Chaupal is to re-engineer physical and information chains in such a way that they become efficient, locally responsive, and enhance overall value for all the participants.

E-Chaupal has de-linked information from transaction through real-time multicasting ability of ICTs, to offer the freedom of choice to the farmer and to the rural consumer. It makes it possible to bundle information, knowledge, and transaction from independent participants in a collaborative business model to deliver unique value to the farmer/consumer and businesses simultaneously. The seamless workflow capability of ICT enables smooth coordination across borders of individual enterprises—all this, without exclusively depending on traditional institutional infrastructure.

One of the advantages of e-Chaupal is virtual aggregation of demand for farm inputs or marketing of farm produce which gives the power of scale to the smallest of farmers. Community based e-commerce models—whether within a contiguous cluster of villages or across geographic dispersion—give the much needed volume linked economies to business enterprises and overcome the lack of physical infrastructure and in the process create viable markets for the poor.

The e-Chaupal is in the process of expanding into a universal business platform and goes beyond basic information provisioning to orchestrating knowledge extension services (farm management, risk management), availability of farm inputs and consumption goods/services (screened for quality, price, local pick-up), and choice of output channel (market access assurance, convenience, lower transaction costs) at the villager's doorstep through interlocking partnerships of specialized agencies.

In six years, more than 6200 e-Chaupals and 10 Chaupal Sagars were created by ITC across eight states reaching out to 35 lakh farmers engaged in nine agri-commodities in 35,000 villages with a vision to reach 100,000 villages by 2010 while delivering extraordinary value to all the stakeholders.

Note: Views expressed here are of the author of the box.

The cost of providing connectivity is, however, high and the scheme can be cost effective only when other services are combined with the agricultural products business of ITC. However, it is evident from this pilot project that there is an enormous demand for value added information although cost effectiveness of the provisioning arrangement in view of its limited usage is a concern.

N-Logue projects in Tamil Nadu and Andhra Pradesh

The project is based on the corDECT product developed by IIT Madras. It provides information kiosks, in over 2000 villages in the state of Tamil Nadu and to a lesser extent in Andhra Pradesh and Madhya Pradesh. The kiosk is connected to the terminal of an ISP through a 70 kbps wireless connection using corDECT technology which in turn provides internet based services including e-education, e-medicine, video conferencing, cyber chatting as on-line products and computer training, photography (still photography) as off-line products. These kiosks are owned by villagers, part financed by N-Logue and partly by the villager himself. The reported income per month varies between Rs 3000 to 5000, indicative of the quantum of demand of these services in rural areas. The cost of product provisioning is not very high but can be made more attractive through further expansion and certain regulatory interventions. Availability of power is a major concern in all such projects. There are various evaluations of these projects. About 50–60 per cent kiosks do well.

Andhra Pradesh Broadband Network

This is the most comprehensive and integrated effort so far in any of the states and aims at broadband connectivity across AP at an affordable cost within a viable tariff structure. The Network plans to provide ten Gbps up to each district H.Q., one Gbps up to each Mandal H.Q., and 100/50 Mbps up to each village using fibre/wireless.

From the analysis of the pilot projects, it is evident that a market exists in rural areas for not just voice telephony but also a variety of other value added services including Internet Protocol TV (IPTV) which can be provided through data circuits. A number of additional value added services can be designed and implemented by service providers, once these

Table 4.1.12
Capex/Opex of Broadband connectivity projects

	A.P. model		N-logue		E-chaupal	
	Per village	For 75000 villages	Per village	For 75000 villages	Per village	For 75000 villages
Capital Cost	0.93 lakh	701 crore	0.5 lakh	375 crore	1.2 lakh	900 crore
Operational cost (Annual)	0.25 lakh	188 crore	0.25 lakh	188 crore	0.53 lakh	398 crore
Delivered bandwidth at village level	100 Mbps		70 kbps		64 kbps	
Revenue			Income/ year from year 2nd Kiosks: Rs 20,000 to Rs 1 lakh/ year Profitability Project HQ: Rs 30 lakh/ year (To be shared by project HQ/ company).		Breakeven happens after 4th–5th year of Operations Revenue HQ: 14.1 Crore approx. (With 30% Projects in their 1st year of operation and the rest in their 2nd year of operation) Revenue Franchisee: Total revenue = 1% of total transactions Approximately 4.5 crore, assuming 450 crore transactions made in one year. Approx. Rs 14063 per year per Franchisee Revenue Agent: Approx. 1.25 crore, assuming 450 crore transactions made in one year. Approx. Rs 62500 per year per agent	

Source: World Resource Institute and TRAI.

networks are converted into IP based converged or unified networks. The cost effectiveness of some of these projects for scaling up to a large number of villages or all the rural areas in the country is, however, not entirely proven at this stage (Table 4.1.12). But these projects are being expanded at a very fast pace. Success of these projects will depend on:

1. unified licensing or convergence framework,
2. USO Funds for infrastructure efforts on a technology neutral basis,
3. assurance of government business to these networks.

The market will automatically choose the best mode of delivery for different areas and locations depending on their requirements.

The main reason for better performance of these projects appears to be the greater stake of the entrepreneur in the schemes, involvement of the NGO, facilitation of funds, and training of the entrepreneur. The cost of implementing these schemes is also not much and a major proportion of the costs is recoverable in business once the network stabilizes, particularly in high-density villages.

If voice telephony is added to such networks, they may be more viable and it is suggested that the Unified Licence Policy, when implemented across the country could unlock this potential (Jain, 2006). It is quite possible that in spite of the best efforts of the cellular/UASL operators, they may not be able to increase the penetration of telecom services in very backward areas from the telecommunication point of view. In such situations, a bottom up approach by promoting small operators in partnership with local population may help. Keeping this aspect in mind, a concept of niche operators in Short Distance Charging Areas (SDCAs) where tele-density is less than 1 per cent may be considered for early approval (TRAI, 2005a).

To sum up, (i) the rural market for communications is not entirely based on voice telephony nor is voice telephony service by itself remunerative enough due to high infrastructure cost, (ii) there is a substantial demand for value added services provided on data circuits but such data circuits by themselves are not sufficiently remunerative to be scalable to all parts of the country, (iii) innovative projects of a small entrepreneur working as franchisee of a large service provider, have produced interesting results. Such entrepreneurs, utilizing their own infrastructure of a specific nature, are often more successful than very large operators, and (iv) if these projects can give the entire range of triple play services (including TV), facilitated by IP networks, the demand in rural areas for such networks

would be large, and they would be more viable than single play networks.

Rural BPOs

The BPO business has four main inputs: communications systems, hardware, infrastructure, and people. The cost of communications and hardware is not in the direct control of the industry, but BPO operators can directly control costs related to infrastructure and people. Simply put, the rural BPO shifts the location of outsourced work from urban to rural areas. Lason Inc. (a US based outsourcing firm), GramIT (associated with Satyam), and Datamation (a Delhi-based group), are three of the key players in the Indian rural BPO scene. Their approaches to the business also frame the different execution possibilities.

A variety of business models have been adopted by the various players, including franchising (see Boxes 4.1.3 and 4.1.4 for more details).

Rural BPO Operators

Lason does not own the specific centres that do the processing, but designates them as franchisees, providing the hardware and training, and monitoring the quality of output. The local owner provides the physical location. Lason estimates that about 30 per cent of the revenues it earned in 2004 came from smaller city and rural sites.

Datamation, on the other hand, owns and operates all the BPO centres it runs. NGOs assist Datamation in hiring and training the workforce for the BPOs. Their operation is based on a not-for-profit philosophy. They also run Hewlett-Packard's rural BPO initiative (begun in February 2000), which is part of a bigger project called HP i-Community.

The Byrraju Foundation, which is associated with Satyam, has launched GramIT, a rural BPO in village Jallikakinada (AP) that employs 200 rural youth, drawn locally as well as from surrounding villages, using the last mile connectivity provided by Project Ashwini, which connects thirty-two village centres with broadband wireless. The GramIT centres are set up as cooperative societies, acting as franchisees of Byrraju foundation.

What Drives Rural BPOs

One of the central advantages for the BPO is that costs associated with infrastructure and people are much lower in rural areas than in urban areas. This allows firms to reduce up to 90 per cent of their expenditures in providing the physical location given cheaper land prices and construction costs. In addition, one of the observations of rural BPO managers has been that employee attrition is lower because jobs are taken to where the people live.

In rural South India a substantially large pool of English language literate youth exists making it easy for BPOs to establish operations and hire workers, implying lower turnaround and hence, lower rehiring and training costs. Another major driver behind the rural BPO model is that it feeds the large demand for low cost outsourcing solutions for services such as digitization of hospital records (proposed by GramIT) and legal documents (the work processed by Lason).

Box 4.1.3
New Wave of BPOs

Pradeep Nevatia, MD & CEO of Lason India passionately believes that rural BPO is the next wave in BPO because this model makes tremendous business sense and has significant social connotations. In March 2005, Lason started operations in Kizhanur, a small village in Thiruvallur District of Tamil Nadu where it processed documents for clients in the US.

Recently, they were approached by Jindal South West Foundation's Corporate Social Responsibility (CSR) wing, which is a part of the OP Jindal Group, to launch a BPO facility in Bellary District, Karnataka. This facility has generated numerous employment opportunities and is helping to bridge the technology divide in the region. In future, the Jindal Group may outsource its business processes to this BPO site. This joint venture is an indication of how even non-IT companies can be a part of the rural BPO revolution and benefit from the same. According to Mr Nevatia, 'Village BPOs mean lesser attrition (because jobs are being taken to where the masses live as opposed to making people migrate from rural to urban areas for employment), which implies lower employee training costs. Therefore, there is better cost efficiency.' He believes that village BPOs will help address domestic BPO needs, such as in the case of e-governance, that requires huge digitization which is currently hindered by the absence of cost-effective solutions. Village BPOs ensure rural empowerment and self-sufficiency, which translate into an improved economy in the long run.

However, initially, sponsor companies need to invest time and money in intensive training and put in place 'Poka Yoke' processes. (The phrase Poka-Yoke is explained on *www.isixsigma.com* as the first step in truly error-proofing a system.) Importantly, the concept of village BPOs is in sync with the government's philosophy of providing employment opportunities in villages.

Source: *The Hindu* (September 12, 2005).

Box 4.1.4

GramIT, a Rural BPO: An initiative of the Byrraju Foundation

Sagarika Bose

Byrraju Foundation is a non-profit organization set up in July 2001 in the memory of the Late Byrraju Satyanarayana Raju, Founder, Satyam group of companies. The Foundation seeks to build progressive self-reliant rural communities by providing services in the areas of healthcare, environment, sanitation, primary education, adult literacy, and skills development. The Foundation currently works in 150 villages in 5 districts of Andhra Pradesh—East Godavari, West Godavari, Krishna, Guntur, and Ranga Reddy.

With the objective of moving rural India from the periphery to the centre of the new economy, the Foundation launched GramIT as an initiative that seeks to engage educated rural youth in the new economy by providing BPO services from the village. The first centre was launched at Jelli Kakinada, about 25 km from Bheemvaram in West Godavari district in August 2005, employing 200 youth from the village who would have otherwise moved to cities in search of job opportunities. The BPO centre does not belong to a national or multinational corporation but is owned, managed, and led by the community.

The GramIT centres follow a BOOF (Build, Own, Operate and Franchise) model. The centre at Bheemavaram will be operated by the Foundation until it attains financial stability (say over six months). The associates of the GramIT centre will then be organized into a Mutually Aided Cooperative Society and the Centre will be franchised out to them. The workforce will have ownership of the centre and be driven by entrepreneurial motivation for greater efficiency and thereby, profit generation. They will assume full responsibility for operations and adherence to delivery schedules. Quality, Processes, Training, Customer Interface, and Business development and Brand will continue to be owned and managed by the Foundation which will ensure that a uniform high quality customer experience is built and maintained. The BOOF model, thus, effectively de-risks all stakeholders—the employees, the investors, and the customers.

GramIT Centre is envisioned as village level productive enterprise (VLPE) that will serve more than one purpose. As each GramIT center will be an independent enterprise that caters to predefined and exacting service standards, it will foster the spirit of enterprise in the village. Not only will they employ villagers, they will also empower villages, by contributing a part of the profits to chalk out and implement strategies for village development, to either supplement governmental programmes or as independent initiatives. They will also give voice to the increasing demand for quality infrastructure and services such as better roads, retailing, education and health in the village. The GramIT being a profit-oriented enterprise will plough back a part of its surplus into the village for providing support in implementing initiatives in health, education, water, sanitation and so on. The innovation is thus an amalgamation of a social cause and a business case.

Selection for training is based on a simple aptitude cum skill test. This is followed by personal interview. The selected candidates undergo intensive training for 8–10 weeks in the village by trainers who are experienced professionals. Post selection, training is rigorous, focussing on honing English language skills, computer and keyboard skills and other soft skills making them fit to be deployable in the ITeS industry. No salary or stipend is paid during the training period.

On completion of the training, the youth are engaged in transaction processing at the GramIT centres that provide back office support to Indian companies, Indian Government bodies and other institutions, offering transaction processing in a variety of areas such as, accounting, HR, bulk mailing, records digitization and archival services, reminder and follow up services, logistics and travel support. As the first customer, Satyam Computer has outsourced some of its internal processes in human resources, bookkeeping and administration. Several other leading corporates and institutions have also offered to support the initiative. The aim is to reach another 250 villages and 2 million people in the future.

GramIT has already seen a number of reverse migrations. Currently over 5 per cent of GramIT associates have migrated back from the cities and this number will grow further. Several educated housewives accounting for nearly 20 per cent of the GramIT workforce, have come to work either for the first time or are returning to work. Unmarried girls, comprising 20 per cent of GramIT associates are seeking employment and earning an income which can be expected to have a positive impact on gender discrimination issues in the villages. Significantly, the youth, who would perhaps be under employed for another five years while they search for 'Government employment', pursue higher education or settle down in a vocation that does not use their education, are now economically useful contributors to the village economy.

Apprehensions about poor connectivity, lack of trained manpower, inadequate orientation towards organized sector working are disappearing. There are positive indicators from the users about the economic potential of GramIT centres, affirming the Foundation's belief in the potential of GramIT as a catalyst of rural transformation.

Note: Views expressed here are of the author of the box.

Agenda for Action

USO and TRAI Act

The TRAI Act has laid down clearly that notwithstanding the tenets of the Indian Telegraph Act, 1885 (13 of 1885), the Authority would ensure effective compliance of USO. Despite this clear provision in the Act, the Regulator has not played a significant role in the enforcement of universal service obligations. The regulator has, however, held periodic review meetings with the USOF and made recommendations on the structure of the USO schemes. In October 2005, it made detailed recommendations on rural telephony and the government has taken decision on these far reaching recommendations in November 2006. Also, as stated above, the fund has been created by the government—it is a part of the Consolidated Fund and disbursements are sanctioned by the Ministry of Finance. USO Fund Administrator who presently prepares schemes and disburses funds, has also been created at the governmental level. It is, thus, very clear that the government presently controls rural telephony, and the regulator plays no substantial role in enforcing its recommendations. There is a need for an organizational restructuring for the USOF.

Last Mile Connectivity

Since many remote regions of India have little or no telecom infrastructure, it might be possible for local service providers (like niche operators suggested in TRAI (2005a)) to provide telecom connectivity by drawing backbone support either from satellite systems or fibre, or even combinations of last mile technologies and high capacity backbones (for example, fibre backbone, WiMax backhaul, Wi-Fi local distribution). Local operators will spur entrepreneurship and allow local knowledge to dictate the design of networks. For example, the FCC in the US has been very supportive of wireless LAN technologies like Wi-Fi, especially in underserved communities like the Appalachian region, the Mississippi Delta, and American Native Villages (which tend to be remote and difficult to access). The FCC has also sought the help of local leaders and has pursued aggressive outreach programmes in these areas (FCC 2004).

Last mile connectivity to sparsely distributed households is costlier than in densely populated areas. Wireless technologies offer a promising alternative 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 innovation and deployment of advanced wireless technologies, providing support for last mile connectivity.

Power Supply

Unavailability of reliable power supply in semi-urban, rural and remote areas increases operational costs because operators have to maintain sufficient backup systems. Alternate energy sources could mitigate this problem, but might be costly to install and maintain. Hence, availability of a reliable power supply is necessary for achieving higher tele-density in rural areas.

Operation and Maintenance Cost

Maintenance costs of the network in rural areas are higher as compared to urban areas because of poor transportation, difficulty in obtaining spare parts, non-availability of skilled manpower and so on. Operational cost of satellite technologies such as VSAT in rural areas is also higher given the additional cost of the bandwidth incurred by the operator and taxes. Unless the number of rural subscribers grows this problem cannot be easily tackled. The present arrangement of one or two telephones in rural areas is obviously not a viable arrangement.

Duties, Levies, and Taxes

Prevailing duties, levies, and taxes are very high. The net result is that the service cost becomes high and unattractive to rural population and enough resources are not left with the operator for major rollout. Instead of levying huge duties and then reimbursing them with the help of USO, a far superior arrangement would be to drastically reduce taxes and duties on identifiable rural inputs.

Licensing Framework

We have seen that technological developments, especially those 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, service specific licensing is losing its meaning owing to the fact that service providers of one type step into the services of another type of licence using the same network. The increasing capability of wireless technology 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, has created a totally new situation. It is, therefore, anticipated that for the rural areas, where the demand is clearly identified to be substantially inclined towards multimedia, a change in the licensing or legal framework will be extremely useful.

Cost of Handsets and Access Devices

Lower income rural households may perceive mobile handsets or access devices as expensive. The cost of handsets 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. This has been possible due to the huge increase in the size of the market, particularly of low priced handsets and a realization among suppliers that India is a highly price-sensitive market and its huge numbers can only be brought into the network if the entry costs are low.

Availability of Locally Relevant Applications

It is also important to increase content access—that is, create applications and services which are useful to the 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.

The creation of necessary infrastructure will bring the market forces into play to create the needed applications at an acceptable cost. However, such a process is often slow and will vary from area to area and will depend upon the state of economic development of the given area as also the extent of awareness generated about ICT in these areas. Thus, a government policy and regulatory support would have to be in the form of the initial seed application and towards this, e-governance and e-health would play a major role.

Affordability of Services

There is evidence to suggest that people will spend up to 2 per cent 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 those with fixed line phones. This indicates that 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.

Competition

The urban telecom growth was driven by aggressive competition among a large number of operators. The present rural telecom policy is dependent on the public sector and government-supported USO schemes on individual telephones, VPTs and so on. The present rural telecom policy, thus, replicates the overall telecom policy during the period 1948–98. Hence, there is a remarkable similarity in the overall telecom growth graph of 1948–98 and the present day rural telecom graph 1996–2006.

Dovetailing State and Central Efforts

One of the most impressive facts about telecommunications in India is that the fibre optic cable runs through every block in the country. Different providers like the railways, Power Grid, oil companies, BSNL, and GAIL have extensive deployments of fibre in many remote areas. One of the possible ways to overcome the problem of remote area communication in India is to employ this latent capacity in the national interest.

The present governmental efforts in e-governance have led to captive government networks up to block level. We need to see whether these networks can be converted into commercial networks, say by handing over NIC (National Informatics Centre) networks to BSNL or by giving NIC an Internet Service Provider (ISP) licence, and then allowing competition by encouraging private networks in these areas and also by giving these networks government business. There is no logic in setting up separate data networks for government business or governance. The Andhra government is trying to encourage a private fibre to village network and is helping its viability by ensuring government e-governance business to this network.

The only solution, therefore, lies in creating sharable infrastructure in rural areas to enable many operators to enter in a viable and competitive manner and create an environment which has led to the urban telecom revolution in India.

Regulatory interventions for sharing fibre already laid by the incumbent from public or USO funds, especially in rural areas are required. From the backbone onwards wireless services may be provided. Reducing levies is essential to drop cost to customer and hence, increase in penetration in new markets particularly rural areas with lesser purchasing power and low density of population.

USO to Fund Infrastructure and not Just Services

A key consideration in evolving these policy and regulatory interventions is that market forces must be allowed to ultimately determine the conditions for rural area telecom services. An appropriate form of subsidy in the short run would be necessary to incentivize the creation of infrastructure. This subsidy would have to be in the form where the emphasis shifts from the present VPT and individual DEL-based subsidy to growth in network using subsidy. Further, these steps would lower the

input cost resulting in the expansion of the market and enhancement of revenues to the government from taxes on the output.

The proposed network infrastructure expansion approach in rural areas will be simpler to implement and monitor. The operators will have to operate their services in a more efficient manner. This will also encourage development of local entrepreneurship in rural areas and ultimately, this will lead to growth of telecom services in rural areas (Box 4.1.5).

Access service providers, who provide telecom services in rural areas, using any technology, should also be given incentives depending upon rollout of infrastructure in rural areas. Due to cost reduction in optic fibre technology and its capability of providing very high bandwidth in last mile connectivity the operator may use this technology in rural/remote areas. It would encourage the rollout of network by using any wireline or wireless technology with support from USOF for shared media. Currently, the amount of support has been quantified for usage of wireless technology depending upon the number of BTSs. Other technologies may also be given incentive of the order of around 50 per cent of the total infrastructure costs.

Spectrum Management

In rural and remote areas with low requirement of spectrum, services should not be taxed heavily. Thus, depending upon the number of BTSs located in rural areas, the service providers should be given a discount in Annual Licence Fee and Spectrum Charges, which are charged in terms of percentage of AGR. The discount on Annual Licence fee and Spectrum Charges could be linked to the rolling out of infrastructure in rural/remote areas. For instance if 5000 BTSs are installed in rural/remote areas, then say, 10 per cent discount may be given in the Licence Fee and Spectrum Charges payable by the operator and percentage of discount may increase further with increasing BTSs.

One may argue that service providers who provide voice and/or data services in rural areas using any other technology including Wi-Fi, Cor-DECT, fibre, and so on should also get subsidy from USOF, just like cellular/UASL operators. According to TRAI, only those access service providers who contribute towards USO should get support at this stage, that is, service providers such as ISPs or franchisee shall not be eligible to get support from USOF. However, there are others who argue that by not allowing proliferation of small operators (in contrast to the policy for cable operators), we may be slowing the spread of services. Some of these operators are too small to have the wherewithal to become a franchise of the service operator. It is conceivable that a small operator, who starts the initial business would like to sell it to more established businesses later. In such cases, the operator should return the quantum of USOF support, along with the interest to the USOF. This model is relevant as the larger service providers

Box 4.1.5

A Possible Roadmap for Enhancing Rural Teledensity using USO Fund

The key features of the rural network are the access through largely wireless means and connectivity of these wireless base stations to the main network. About 20,000 base stations are required to cover 80 to 90 per cent rural population. As the population distribution is not uniform, the initial installations in relatively densely populated areas would provide mobile signals to around 75 per cent of rural population across 2 lakh larger villages.

Table B4.1.5
Funds Required from USOF for Incentivizing Mobile Towers

	Mobile Towers	
	Circular Cells	Hexagon Cells
Total geographical area of India (sq km)	3,287,263	3,287,263
Total covered rural area (sq km)	2,761,300	2,761,300
Average radius covered per site (km)	7.5	7.5
Area under one site (sq km)	177	177
Total sites required	15,634	18,917
Inter-site distance (km)	15	15
No. of sites considered	15,000	20,000

Incentive per site for 3 operators (lakh) = 36
Total incentive for 20000 sites (in crore) = 7200
Source: TRAI (2004 and 2005b).

The total cost of setting up these 20,000 BTSs can be estimated from the configuration of the BTS, the height of the tower, the size of the power plant, the size and type of the backup power plant. The purpose will be served if the costs are estimated on the basis of average configurations—a 40 metre tower with suitable power plant and other features. The cost of one such BTS (including electronic equipment) based on estimates obtained from various operators, works out to around Rs 50 lakh. In case three operators share the tower, the cost of tower plus operator electronic equipment (Rs 10 lakh for each operator) for three would be around Rs 70 lakh.

USO funds could be used to incentivize the roll out through partial subsidy without fully supporting it. This could be done through a support to cover part of the capex as well as part of the recurring operating costs for a limited period of time.

Another important hurdle for the expansion of network in rural areas is the expensive and time consuming process of setting up backhaul connectivity of these BTSs to the base stations controllers (BSCs) and the main telecommunication network. With the existing 600,000 route-km of optic fibre cable network, each base station should, on an average, be within 15 km or so of optic fibre reach. However, this fibre is largely with a single service provider, the incumbent. The Access Service Provider and Universal Access Service Licenses (UASL) provide for the licensees to develop their own infrastructure for rolling out their networks. Thus, unless there is substantial motivation and a win-win deal for all, mandating the provisioning of leased lines even in rural areas, could create disputes. At the same time utilizing this infrastructure rather than waiting for a new one to be laid, has to be a national priority, subject to adequate compensatory commercial terms being offered. TRAI in its Tariff Order dated 21 April 2005 on Domestic Leased Circuits mentioned that it would consider making recommendations to the government on the issue of providing direct support from USO fund to bandwidth providers in rural/remote areas. Quite evidently, the extent of such support would depend upon the price at which bandwidth services are to be made available to the service providers in such areas within the ceiling tariff specified in the said Order. Thus, if it is mandated that those who own optic fibre connectivity in a given rural/remote area, must provide leased lines, these facility owners/service providers could be provided subsidy through the USO fund, possibly to the extent of covering 30 per cent discount on specified ceiling. Assuming that fibre connectivity is already available to each new tower installation within 15 to 20 km and the average distance between BTS and BSC is around 170 km, then an additional burden on USOF for 20,000 BTSs for 5 years would be about Rs 1040 crore. This amount is based on the assumption that each BTS will be connected with its BSC with one E1 only through leased circuits. Even if it is assumed that a minimum of two E1s will be required to connect each BTS, this amount works out to Rs 2080 crore over a period of five years. It is also quite likely that since lease line connectivity between BSC and BTSs is in a point to multi-point configuration, because of usage of common optical fibre cable and other equipment, this burden on USOF may be reduced. This is an indicative figure.

It can be seen that through a support from USOF of about Rs 9000 crore it will be possible to install 20,000 base stations in rural areas with two E1 connectivity to the main network to cover about 80 to 90 per cent of the villages providing access to wireless signals of appropriate bandwidth. Operators will be able to offer telecom services of the type required by rural population at price levels where the cost-benefit ratio will clearly suit its large number of target customers.

There will be some balance amount (approximately Rs 9000 crore) in USOF even after meeting all the contractual commitments for VPTs, RCPs, MARR replacements and rural DELs. Therefore, it would be possible to provide support for network infrastructure expansion and it may not be necessary to increase the contribution from existing level of 5 per cent of AGR of the contributing operators. After contractual commitments for the existing VPTs, RCPs, MARR replacements and rural DELs are completed, only the network infrastructure expansion approach should be followed for providing USOF support. Since the amount of support in this network expansion approach will be less and ultimately the growth of telecom services in rural areas will pick up, therefore, in future the reduction in USO level from the existing level of 5 per cent of AGR may also be considered. However, since ADC Regime has to come to an end in the year 2008 and it has to merge in USO Regime, the contribution towards USO may be suitably adjusted keeping in mind the merger of ADC Regime and also the objectives of USO policy at that point of time. Judging by the past experience in the urban areas and the response received in the pilot trials, a rural tele-density figure of about 15 per cent should be entirely feasible with this proposed 'enabling' approach of infrastructure creation, in the next few years.

The operator who installs BTSs in rural/remote areas should be given one time support (in two installments) of Rs 12 lakh per BTS from USOF, provided the installed infrastructure is shared with at least one other operator. Given the number of operators, three operators per rural tower would be the ideal solution. The other two operators who roll out their services in rural/remote areas and share the infrastructure like tower/shelter and power supply with the already existing operator in that area will provide the infrastructure. Ground based towers (as is common in rural areas) would receive support of such magnitude. In case roof-top/pole mounted towers are used, the support and distance criteria can be suitably scaled down. This support should also be given for existing BTSs, which start sharing and are installed beyond cities/towns and the service providers give the mobile connections in their coverage areas. In order to avail the above mentioned support the two ground based towers installed in rural areas must be empirically 15 km apart. However, looking at different terrains, the distance might vary and therefore, it may be prescribed that for eligibility under the scheme, the minimum distance should be 12 km. It is also possible that the passive infrastructure like tower, shelter and back up power supply may be installed by infrastructure provider. This infrastructure provider will have to settle their commercial arrangement with these access providers.

are going to take the top down approach to diffusion of rural services as highlighted earlier.

At present, the necessary clearances (including SACFA clearance) are required to be taken in advance for installing the tower. Even if post facto approval is permitted for installing towers, Wireless Planning and Co-ordination (WPC) wing of DOT will have a centralized database of all towers installed by operators. This may help in verifying the location of towers and thus make the scheme simpler from the implementation point of view.

There are several management challenges in the above suggested plane. For example, does the USOF have adequate staff and requisite support to roll out this plan? The roll out envisages active coordination with private operators, seeking collaborations and monitoring the rollouts. In this context, a third party study that can identity the bottlenecks in the existing USOF has not been planned. Since the existing USOF plan and the proposed plans are highly visible programmes, there should be an early review mechanism designed as a part of the plan.

ANNEXE

Table A4.1.1
Computation of Committed Subsidy towards VPT, MARR, and RCP (Public Access Facility)

	Particulars	
1.	VPT Subsidy	
	Number of VPT (in lakhs)	3.2
	OPEX subsidy per VPT per year average (in Rs)	5357
	Total VPT subsidy per year (in Rs Cr.)	171.4
	Total VPT subsidy for 7 years (in Rs Cr.)	1200
2.	MARR replacement	
	Number of VPTs (in lakhs)	1.86
	CAPEX per year Average (in Rs)	11518
	Total MARR susbsidy per year (in Rs Cr.)	214
	Total MARR subsidy for 7 years (in Rs Cr.)	1500
3.	Uncovered Villages	
	Villages covered through satellite	14000
	Upfront per satellite (in lakh)	1
	Total upfront cost-Capex (in Rs Cr.)	140
	OPEX per year (in Rs) – average	11739
	OPEX per year (in Rs Cr.)	16
	OPEX per year for 5 year (in Rs Cr.)	82
	Non-satellite Villages	46000
	Upfront per village	25000
	Total upfront cost (in Rs Cr.) – one time	115
	OPEX per year Average (in Rs)	4295
	OPEX per year (in Rs Cr.)	19.757
	OPEX per year for 5 year (in Rs Cr.)	99
	Total subsidy for uncovered villages	436
4.	RCP	
	Total Number of RCP	46253
	Upfront per RCP (Average)	23200
	Total upfront cost (in Cr.)	107
	OPEX per year Average (in Rs)	2000
	OPEX per year (in Cr.)	9
	OPEX per year for 5 year (in Cr.)	46
5.	HPTIC	
	Total no of HPTIC	2000
	Upfront per HPTIC (Rs in lakh)	1.5
	Total upfront cost (in Rs Cr.)	30
	OPEX per year per HPTIC (in Rs)	25000
	OPEX per year (in Rs Cr.)	5
	OPEX per year for 5 year (in Rs Cr.)	25
	Total commitments (Rs Cr.)	3344

Source: TRAI.

Table A4.1.2
Total DEL Subsidy required to achieve additional 66 lakh rural DELs by 2007 (estimation by USOF)

		DELs Subsidy									
		Subscriber Base			DEL (from 1/4/2005 to 31/3/2010)				DEL (from 1/4/2002 to 31/3/2005)		
S. No.	Year	Subscriber base as 1st April (in Rs Crore)	Additional subscriber during the year (in Rs Crore)	Subscriber base as on 31st March (in Rs Crore)	Estimated Capex (in Rs Crore)	Estimated Capex to be disbursed (in Rs Crore)	Estimated Opex (in Rs Crore)	Estimated Opex (to be disbursed (in Rs Crore)	Capex Disburse-ments in Rs Crore)	Opex Disburse-ments (in Rs Crore)	Total Amount Disburse-ments (in Rs Crore)
1.	1/4/2002-2005	–	0.15000	–	–	–	–	–	–	–	–
2.	2006	1.3456	0.2600	1.6056	2,600	1950	390	292.5	1500	225	3967.50
3.	2007	1.6056	0.4000	2.0056	4000	3650	990	840	0	225	4715.00
4.	2008	2.0056	0.00	2.0056		1000	990	990	0	225	2215.00
5.	2009	2.0056	0.00	2.0056			990	990	0	225	1215.00
6.	2010	2.0056	0.00	2.0056			990	990	0	225	1215.00
7.	2011							248			247.50
		Total	0.6600		6600	6600	4350	4350	1500	1125	13575
								10950		2625	
Allowed disbursement							Approx	11000	Approx	2600	
Total Disbursement required											13575

Note: Total subsidy required for meeting present commitments (VPC, MARR, RCPs and DELs) = 3344 Rs crore + 13575 Rs crore (DELs) = 17000 Rs crore.
Source: TRAI.

Table A4.1.3
Total DEL Subsidy required for achieving 4% rural tele-density by 2010

		Subscriber base			DEL (from 1/4/2005 to 31/3/2005)			DEL (From 1/4/2002 to 31/3/2010)				
S. No	Year Ending	Subscriber Base Opening for Fina-ncial year (in Rs Crore)	Addi-tional subs-criber during the year (in Rs Crore)	Subscriber base at Closing of Fin. Year (in Rs Crore)	Capex due (in Rs Crore)	Capex Disbursed (in Rs Crore)	Opex Disbur-sement (in Rs Crores)	Capex Disbur-sements (in Rs Crore)	Opex Disbur-sements (in Rs Crore)	Total Disbur-sements (in Rs Crore)	ADC for lines not covered by the USO Fund (Estim-ation)	Total USO
1.	2006	1.3456	0.2600	1.6056	2600.00	2600.00	390.00	1500	225	4715	0	4715
2.	2007	1.6056	0.4000	2.0056	4000.00	4000.00	990.00	–	225	5215	0	5212
3.	2008	2.0056	0.2407	2.2462	2406.68	1805.01	1351.00	–	225	3381	0	3381
4.	2009	2.2462	0.2695	2.5158	2695.48	2021.61	1755.32	–	225	4002	2774	6776
	2010	2.5158	0.3019	2.8177	3018.94	2264.21	2208.17	–	225	4697	2329	7026
		Total	1.4721		14721	12691	6694	1500	1125	22010	5103	27113

Note: It is assumed that ADC regime gets concluded in the year 2008. ADC calculated for 11.96 Rs crore Rural DELs not covered in USO Total subsidy required for meeting present commitments (VPT, MARR, RCPs & DELs) = 3344 + 22010 Rs crore (DELs) = 5103 Rs crore ADC for rural lines not covered by USO = 30457 Rs crore.
Source: TRAI.

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