

White Elephant or a Game Changer?

An Analysis of National Optical Fibre Network of India

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The National Optical Fibre Network is being implemented largely by public sector organisations in the country. NOFN will connect 2,50,000 gram panchayats. It aims to deliver information and communication technology-based goods and services to the rural households by private service providers by December 2016. Despite support from the top political leaders, the project is delayed by more than two years by bureaucratic hurdles and lack of excitement on the part of the private players. The pilot implementation of the project was able to connect only the government offices. This paper suggests that the absorptive capacity needs to be developed and private players require aggressive goading, but without ignoring the idea of social inclusion. There should be a sustained political support till the final implementation of the project, with large impetus coming from the government in the initial phases.

The Indian telecommunications industry is one of the fastest growing in the world and has been hailed as a success story like no other. In the past two decades, since its liberalisation in the early 1990s, the Indian telecom sector, in general, and mobile telephony, in particular, has witnessed significant growth. India now is the world's second largest telecommunications market, with 973.35 million subscribers as of 30 April 2015 (TRAI 2015), with a cumulative annual growth rate of 32% in 2000–10, much higher than the world average, 17.3% (TRAI 2012). This growth can be easily attributed to the increasing network coverage and a competition-induced tariff structure that is touted to be the lowest in the world. The sector's revenue grew by 13.4% to reach \$64.1 billion in the financial year (FY12) and is expected to witness up to \$56.3 billion in investments and an expansion in size to \$101 billion in the next five years (TRAI 2012).

Since the early 2000s, several private and public players have deployed information and communication technologies (ICT). The reach of telecommunications in the country and the rhetoric demonstration of its impact observed elsewhere in the world pressured the Indian government to accelerate the growth of broadband services in the country. The government is at present implementing an ambitious broadband infrastructure plan through an optical fibre network connecting gram panchayats, a local administrative region for group of villages. This paper analyses the ongoing process, its objectives, possible challenges and offers some recommendations.

Like the banking and other sectors, the Government of India too saw ICT as an effective and efficient means of delivering government to citizen (G2C) services. The National e-Governance Plan (NeGP), comprising 27 Mission Mode Projects (MMPs) and 10 components was approved by the union government on 18 May 2006. E-governance was set to evolve from mere computerisation of departments into a service-oriented, seamless and transparent offering at the citizen's doorstep (Gupta 2010). Implementation of the NeGP involved setting up of common and support IT infrastructure such as: State Wide Area Networks (SWANs), State Data Centres (SDCs), Common Services Centres (CSCs) and Electronic Service Delivery Gateways.

The establishment of CSCs in rural areas was one among the many mission mode projects. The CSCs were to provide high quality and cost-effective video, voice and data content and services, in the areas of e-governance, education, health, telemedicine, entertainment as well as other private services.¹ As the government was thinking about electronic governance, it

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was also looking at broadband. A broadband policy was introduced in 2004. According to the preamble of the policy,² the government recognised the “potential of ubiquitous Broadband service in growth of GDP and enhancement in quality of life through societal applications including tele-education, tele-medicine, e-governance, entertainment as well as employment generation by way of high speed access to information and web-based communication.”

The international policy climate for broadband also served as an impetus for ushering broadband into India. In May 2010, the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization set up the Broadband Commission for Digital Development as part of efforts to meet the Millennium Development Goals (MDGs). The commission underlined that expanding broadband access in every country was vital to accelerating progress towards these MDGs by the target date of 2015 and sought commitments from all member countries to implement such plans. As a continuation of this, the Office of Adviser to the Prime Minister on Public Information Infrastructure and Innovations, released a 15-page white paper entitled, “Broadband to Panchyats” (PIII 2010). This paper outlined the need to extend high speed broadband services to 2,50,000 gram panchayats in the country through an optic fibre network.

Gram panchayats are the local self-government body at the village or small-town level in India. A population of 500 is required to have a gram panchayat. Sometimes two or three villages are combined to form a panchayat, hence the size varies from state to state (for more details, see Buch 2012). Gram panchayats have been at the core of the governance structure in rural India. The panchayats are key interface points for administrative programmes and are vital channels for pushing the inclusive growth agenda of the government in rural India through delivery of beneficial public services and entitlement programmes such as food security, financial inclusion, agriculture, health, education, etc. To meet the inclusive agenda, services such as e-medicine, e-education and e-commerce need to be implemented for the people who are scattered across the vast geography and are not yet achieved fully literature. Hence the need for multimedia-based applications that use intensive bandwidth enabled by internet technologies.

For such an all encompassing ICT platform to be operationalised at the gram panchayat level, both speed and capacity were required. By 2010, 86% of India’s broadband connections were being provided using digital subscriber line (DSL) technology with 60% of the subscribers and 75% of such connections existing in the top 30 cities in the country (PIII 2010). DSL connectivity was non-existent in rural India due to low penetration of copper cable pairs. State-owned players too had thus far not invested in high speed infrastructure beyond the district headquarters as part of the SWAN initiative.

By 2010, only 053% of India’s broadband connections were working on optical fibre. The country had close to 1 million route kilometres (rkm) of optical fibre network available and of this nearly 6,50,000 belonged to the state-owned Bharat Sanchar Nigam Limited (BSNL). Hence deployment of optical

fibre involved significant costs and additional challenges in terms of acquiring the Right of Way (ROW) and laying the cable and installing the associated equipment. The white paper estimated a cost of \$2.66 billion and 24–30 months for the complete deployment through the creation of a special purpose vehicle (SPV) of relevant public sector stakeholders and departments. On 25 October 2011 the Government of India approved the setting up of the National Optical Fibre Network (NOFN).

The above contextual text is incomplete without a discussion on rural telephony in India.³ Despite the impressive overall tele-density wireless segment, 77.4%, rural is comparatively low, 47.69%, when compared to urban, 143.64% as of April 2015 (TRAI 2015). The government has been recognising this gap and pushing the operators to provide the telecom services in rural areas. The stipulated 10% rural coverage is not met by the private operators who preferred to pay the penalty rather than rolling out (Jain and Raghuram 2009). Given this disparity, questions might be asked on the feasibility of broadband success when the basic mobile services have not penetrated adequately in the rural areas. Prasad (2013) argues that there is merit in building the broadband infrastructure, even with the extant low penetration and absence of absorptive capability. It is justified by the criteria of temporality (longer time taken to build infrastructure, meanwhile people catch up) and performance discontinuities (shift from low to high technologies with passage of time).

National Optical Fibre Network

Organisation: In December 2010, the Telecom Regulatory Authority of India (TRAI) released a report of recommendations on the growth of broadband in India (TRAI 2010). This report echoed many suggestions or options listed by a study (Analysys Mason 2010) sponsored by the Confederation of Indian Industry (CII), a major trade association in India. The report stated that as of September 2010 penetration of broadband⁴ in the country was 8% as against a tele-density⁵ of 60.99. The number of broadband connections was only 10.3 million as against a target of 20 million by the year 2010. It recommended the establishment of a national broadband network connecting all habitations with population of 500 and above.

In October 2011,⁶ a committee headed by Sam Pitroda, adviser to the Prime Minister, suggested setting up of an SPV comprising central public sector undertakings (CPSUs) which already had deployed optical fibre cable networks for their internal use. The proposal suggested that BSNL, Rail Tel, the telecom arm of the Indian Railways, Gail Tel of the Gas Authority of India and Power Grid Corporation be part of the SPV. In January 2012, the government formed a SPV for the same, called a Bharat Broadband Network Limited (BBNL) and incorporated it as a public sector undertaking (PSU) on 25 February 2012. BBNL was to be a wholesale bandwidth provider who would provide non-discriminatory access to the NOFN infrastructure to all service providers. BBNL was granted a National Long Distance Operating licence by the Department of Telecommunications (DoT) with effect from 1 April 2013. The funding for the project was to be made available from the Universal Service Obligation Fund (USOF).

In 2009, the existing fibre optic infrastructure deployed by various operators was approximately 1.1 million rkm and covered the entire urban area but had only limited presence in villages and rural areas. BSNL accounted for most of the existing fibre infrastructure (~60% of the total) and had Points of Presence (POP) in all the districts/cities and 28,000 villages. These POPs were mainly installed at the existing 38,302 telecom exchanges of BSNL which were connected through fibre. Apart from BSNL, Rail Tel, Power Grid and GAILTEL had also deployed fibre infrastructure for their internal use and for leasing out excess capacity to other companies, but this infrastructure was primarily deployed along the railway and main utility lines, and was thus not optimised to reach a large number of remote rural areas. The existing infrastructure of private operators such as Airtel, Reliance Communications and Tata Communications was restricted to the top 150 cities. It was estimated that additional optical fibre cable (OFC) deployment of 3,01,000 rkm (5,00,000 according to BBNL 2014) mainly from blocks to villages to cover the 2,50,000 gram panchayats as part of the backhaul network was needed (Analysys Mason 2010).

The final deployment plan was based on utilising the existing optical fibre network of BSNL, Power Grid and Rail Tel. Allocation of gram panchayats to BSNL, Power Grid, Rail Tel was to be in the ratio of 70%, 15% and 15%, respectively. The schedule timeline for completion was to be 24 months.

As per the initial plans, the NOFN was to be rolled out in a phased manner at a cost of \$4 billion and was slated for completion in December 2016 (DOT 2014). Later, the Telecom Commission approved a three-phase implementation of NOFN. The first 1,00,000 gram panchayats were to be covered in the first phase up to 31 March 2014 and an additional 1,00,000 gram panchayats were to be reached by 31 March 2015 (DOT 2015). Priority was to be accorded to villages in the north east region of the country and 88 districts in the heart of the country affected by left-wing extremism. Upon the completion of the NOFN roll-out, gram panchayats were expected to get broadband connectivity with speeds of up to 100 megabits per second. The proposed completion date for the project was December 2012. As part of the project, the state governments were given the role of providing free ROW for laying OFC.

BBNL (2013) decided that the NOFN would use Gigabit Passive Optical Network (GPON) Technology.⁷ This technology reduces the amount of fibres from the central offices (CO) as compared to a point-to-point system. One, or fibre pair, from the CO in the network can be split into several subscriber lines by use of passive optical splitters. These splitters are inexpensive and do not use electronics and have no maintenance and power supply is required. They can be kept at any convenient location in the network.

Goals: It was expected that various services or goods for the rural population could be delivered through broadband, especially through public service institutions. Available numbers indicated (TRAI 2010) that leisure activities music and video downloading, searching for information, especially education related, are gaining popularity and showing considerable increase in internet

usage in rural India. As compared to urban areas, music/video on internet was more popular among the rural users with 67% of rural users accessing the internet for this purpose as compared to 45% in urban areas. In addition to this, rural users were also increasingly using the internet for email, text chatting and general information search. This increasing absorption of ICT in rural areas signalled a significant impact of broadband in future.

Another area where broadband was expected to play notable role is e-education (TRAI 2010). Various initiatives of the government for increasing the use of ICT in education were already in progress (for instance, Sarva Shiksha Abhiyan (Education for All) programme had a component of computer-aided learning, wherein a provision of \$5 million per district had been made as an innovation fund). The centrally-sponsored scheme "Information and Communication Technology [ICT] in School" was launched in December 2004, to provide opportunities to secondary stage students to develop ICT skills and also for ICT-aided learning processes to be adopted. Many states had already made provisions in their IT policies for encouraging the use of IT in schools/colleges/education institutes. Based on this, it was clear that there would be a considerable demand for broadband from the education sector and at least 2 mb of connectivity would be required for each such educational institution.

The health sector too had been plagued by the near absence of infrastructure and a dearth of trained staff, especially in hard-to-reach rural locations. As per the TRAI (2010), 75% of the health infrastructure, manpower (including the qualified consulting doctors practise) and other health resources were concentrated in urban areas, 23% in semi-urban (towns) and only 2% in rural areas; whereas 70% of population lived in the rural areas. Hospital beds per 1,000 people were 10 in rural as compared to 2.2 in urban areas. Medical advice, monitoring, diagnosis and training delivered through broadband could help in bridging these gaps.

Deployment of ICTs by small and medium enterprises or ICT-based enterprises, especially for the rural population or by them, would help to expand the e-commerce market which was tipped to be the next growing business sector in India. Broadband is expected to help in this growth.

The general elections of 2014 brought in a new government at the centre which appears to be committed to the idea of digital India.

Present Status

No doubt, there are many positives in NOFN. It is a powerful enabler for advancing economic and social development through the creation of new types of economic activity, employment opportunities and the enhancement of networking and participation, while taking to fruition the inclusion agenda of the government. However, the implementation seems to be a problem to achieve the desired results.

The NOFN was to be rolled out in a phased manner and was slated for completion in December 2012. It was subsequently pushed back to December 2013 and then it was reported that implementation was delayed by as many as four years (Prabat 2014a). The chairman of TRAI at a public function summarised the implementation status more aptly, "We have done a terrible

job in broadband. We are nowhere near to meeting target of NOFN and unless it is done, Internet penetration cannot happen at the desired pace.”⁸

The cabling and trenching (c&t) work by BSNL, Power Grid and Rail Tel had been delayed, as their initial funds to deploy manpower and payment of salaries of executive staff were not cleared by the cabinet even as of February 2014 (Prabat 2014b). This had pushed the first phase itself back by two years. The above three players are supposed to subcontract the c&t work to multiple vendors as a part of implementation which has not been done. As of January 2014, even the tenders for c&t were not finalised (Prabat 2014a). On the other hand, BSNL blamed BBNL for not giving the clearances.

Though not related to NOFN, private players who were laying OFC in cities were being charged heavy levies of nearly \$2 million for 1 km by the municipalities.⁹ This prohibited the possible demonstration effect of impact on broadband, as many telecom players were reluctant to make this large investment.

Evaluation: BBNL had embarked upon pilot projects in three blocks covering 59 gram panchayats in three different states (BBNL 2014). All participating PSUs (that is, Power Grid, Rail Tel and BSNL) were asked to execute a pilot project in one block each within 90 days. These blocks were Arian in Ajmer District (Rajasthan), Parvada in Visakhapatnam (Andhra Pradesh) and Panisagar in North Tripura District (Tripura). The target date for completing the pilot projects was 15 October 2012, and the same has been achieved with fibre laid out to all the gram panchayats in the pilot blocks and electronic equipment (OLT and ONT) having been tested for offering services. As of July 2015, there are 2,407 active gram panchayats (BBNL 2015).

The pilots brought home ground realities to the participating PSUs and helped the concerned government departments plan the template for pilot testing of G2C services. It also helped to address the interfacing of NOFN with access operators at gram panchayats and issues related to coordination between the three organisations for better execution. BBNL had also formed an alliance with ministries of rural development, panchayati raj, human resource development, health and family welfare, and women and child development so that their demand aggregation would optimise the utilisation of the NOFN infrastructure from an e-governance perspective.

The three pilots envisaged were completed and as many as 22 states and four union territories agreed to providing ROW for NOFN. Several pilots of e-services by both government and private sector establishments are under progress to ascertain their viability, scalability and replicability across the country (BBNL 2014). Though the mission and intentions are indeed creditable, several weaknesses are apparent in this grand plan. As stated earlier the project is already behind schedule and is now to be completed only in September of 2015 or later. Many argue that the plan to lay fibre to everyone of the 2,50,000 gram panchayats was meant only to utilise the Universal Service Obligation Funds (USOF) which as stipulated by law could be used only for telecom-related purposes. These detractors further claimed that while the government had delivered the supply push little

had been done to create a demand pull. Even in the e-governance space, many of the line departments that were to deliver the services were themselves not ready at the back end.

In essence, a national capacity-building plan has not been defined and neither has a single nodal agency been identified for creating and supporting a cohesive all encompassing broadband-enabled ecosystem. Also absent are incentives to private players to provide last mile access and deliver services in rural areas. While several trials/models in the areas of e-banking, e-agricultural support, e-education, e-health and e-commerce are being studied, traction is yet to be achieved in creating viable economics and commercials to scale these across the country. Demand is still to be generated and while the government’s plan to subsidise access to the rural households holds promise, measures are still wanting when it comes to creating relevant content for the rural citizen and building awareness in her/him on the benefits of such e-services. While availability and accessibility of infrastructure have been planned for, its affordability and acceptability vis-à-vis a rural household still remain unaddressed.

An Expert Committee

Disappointed with the delays and budget overruns, the government constituted an expert committee to look into matters relating to the speedy implementation of the NOFN. The committee comprised members from the government, former presidents of the National Association of Software and Services Companies (NASSCOM) and past and present heads of the educational institutions. The committee submitted its report (DoT 2015) to the government in March 2015. It noted the physical progress of NOFN since January 2013 had been tardy and targets had fallen behind by a substantial margin. The committee held discussions with the implementers and BBNL to understand the challenges and problems faced by them in implementation and grouped these issues under three categories—technology and architecture of NOFN, implementation strategy and broadband service delivery. While the committee made several observations, some salient ones were:

- (a) The framework for integration of NOFN with other government networks like National Knowledge Network and SWAN, etc, for effecting service delivery has not been provided.
- (b) Non-involvement of states, an important collaborator in the project, in the planning and implementation of NOFN had led to a distancing of the state from ownership of the project and resulted in slow progress besides the risk of the infrastructure not being utilised. This is affecting the project at all stages.
- (c) Lack of ownership of the project by the CPSUs and the inability of BBNL in ensuring timely project implementation due to inter-agency coordination problems were further exacerbated lack of accountability, financial or otherwise, in project implementation.
- (d) Network roll-out on a nationwide scale through limited agencies, due to the absence of competitive market price-led project management.
- (e) The near absence of any interlinkage with the providers of content and services is sure to lead to a situation where even if the networks were established, their utilisation would be extremely low, hindering the vision of the project.

(f) The Service Level Agreement, wherein customers can legally bind the service providers on delivery is difficult to enforce, due to the linear topology architecture followed and uncertainties about the health of BSNL fibre resulting in weak reliability of the connectivity. Hence, the possibilities of gainful utilisation of bandwidth for non-governmental purposes are substantially reduced.

Some of the concerns of the committee are already known to the BBNL, as inferred from their reports (for instance, BBNL 2014).

One strong recommendation that the committee made was that the project may be renamed as BharatNet¹⁰ to reflect the national aspiration through the vision articulated below:

BharatNet shall be a project of national importance to establish, by 2017, a highly scalable network infrastructure accessible on a non-discriminatory basis, to provide on demand, affordable broadband connectivity of 2 Mbps to 20 Mbps for all households and on demand capacity to all institutions, to realise the vision of Digital India, in partnership with States and the private sector (DoT 2015: 27).

The committee in its report to the present Telecom Minister Ravishankar Prasad has suggested that access be given to the various networks being built by the government to people interested in it, including private companies. The new government has set a target to complete the roll-out in 50,000 village panchayats by 31 March 2015, and another 1,00,000 by March 2016 and the rest by end of 2016 this coming with almost a fourfold increase in cost from an earlier estimated \$3.3 billion (Rs 20,000 crore) to a new \$12.3 billion (Rs 72,778 crore). It is claimed that the government has already rolled out the NOFN to 20,000 villages by April 2015.¹¹ It is also important to note that the recommendations made by the committee are mere recommendations and the government is not bound by the law to implement the same.

Discussion

Despite the weaknesses identified and addressed by the committee, there remains huge potential for different value added services (VAS) once broadband access is made available. The real potential for ICT growth still remains untapped in rural India. The need is to attract quality content/application players who would drive the creations of the ecosystem while reaching the unreached in rural areas. While balancing the bottom line and a social agenda may keep private players away, as indeed it has, the onus is on policymakers in general and “facilitators” like BBNL in particular to create the demand pull that would make this an attractive business proposition for private stakeholders of the ecosystem.

The biggest threat to the NOFN project is its becoming another “white elephant” which finds no takers and lapses into disuse. This would require concerted measures on part of the government. While the government hopes that NOFN will help bridge the current gaps in India’s progress report and create the foundation for inclusive growth and sustainable development across the nation, the response of other stakeholders including the private sector has at best been tepid. Several other challenges, however, require immediate attention. Government-run telecom providers have always had their set of challenges with inefficiencies, infrastructural inadequacies, lack of manpower, management shortages and consequent customer dissatisfaction.

It is feared that several of these issues will plague the NOFN roll-out as also its subsequent operations.

The other major worrying concern is low use of core network in several areas leading to end of life to equipment which, in turn, would require replacement causing further delays and waste of investment. Private players, thanks to their commercial compulsions, invest time, effort and money in the upkeep of their networks. It is feared that lack of commercial returns or continued patronage from the successive governments may reduce the motivation to keep the NOFN well maintained.

Affordability of high-end bandwidth intensive services for village households still remains a grey area, and unless adequately addressed by the government would leave the rural areas financially unattractive for private players to invest in access infrastructure and service. While the plan is to pull fibre to every gram panchayat, connection to the household is left to others whose quality may differ. Such diversity consequently may not be of the same quality level as a fibre to the x (FTTx) link as touted in the National Broadband Plan. With the spread of 4G services on the anvil, better technologies would become available in the market for parties interested in high levels of bandwidth and this may render the NOFN dated. A representative of NOFN¹² and surveys in the pilot sites (BBNL 2014) observed that the electricity is a major problem. In a pilot location during the trials, there was no electricity from 9 AM to 7 PM and installing inverters for 12-hour back-up could serve only as a temporary solution. As the perceived size of the rural market is too small for investment, the response from the private service providers is lukewarm. Initial journalistic reviews of NOFN in Tripura (Bose 2014), a hilly region of ethnic minorities, showed that government-driven e-learning, direct cash transfers and communications have improved greatly and there are problems in functioning of e-health or electronic outpatient department due to weak digital literacy skills. In another report (Thomas 2014) the consumers were not aware of the project and of potential benefits they could receive from NOFN.

Following are few suggestions that would help the project to meet the objectives.

Need for Development of Absorptive Capacity: Kelly and Rossotto (2012) argue that the impact of broadband on the national economy is possible only when there is adequate absorptive capacity present in the system. Under this model, the supply of broadband network platforms is the first necessary condition (that is, broadband infrastructure must be made available), a step clearly taken by the Government of India. The multiplier effect of broadband can positively influence gross domestic product (GDP), productivity and employment growth; provided there is absorptive capacity, to learn and incorporate broadband capabilities into other sectors, to realise such benefits.

Absorptive capacity is the presence of a mechanism by which the benefits obtained from broadband flow into the economy, allowing this technology to unleash its enabling potential. The need is for non-ICT sectors to use and create broadband-enabled services and applications, as this boosts demand and encourages further network deployments while

keeping these networks well-maintained and the network technologies therein up to date. Also, broadband users (citizens, businesses and government) must also have the capacity to understand, learn and utilise capabilities of broadband across the economy and society. Thus, to fully realise the benefits of broadband, the various sectors of the economy and society must have the capacity to acquire, assimilate, transform and exploit the capabilities enabled by such a platform.

The existence of broadband alone has limited impact as a technological platform, but it holds the potential to have a significant impact on economic and social progress and to transform the economy. Policymakers should facilitate the capacity to understand and incorporate the many benefits of broadband by developing and implementing policies that are complementary to broadband build-out. They also need to encourage the private sector to adopt broadband as an input to drive productivity, growth, innovation and welfare throughout the economy and society. Governments should seek to stimulate demand and uptake of broadband through the creation of an enabling environment by addressing awareness, affordability and attractiveness (perceived value) of broadband services.

The review committee recognised that the best way to promote usage at the end level would be to involve, incentivise and harness multiple players, including but not limited to those involved in the roll-out. This they felt would also ensure that the assets so created are utilised on an ongoing basis, are maintained and “remain gainfully alive” (p 90) over the entire life cycle of the asset.

Inclusion as Part of Business Agenda: The government had realised that in order to meet the demand pull created by the MDG targets to be achieved by 2015, technology would need to be harnessed. It appears that policy institutions, TRAI and BBNL recognise the potential that broadband holds. It is envisioned, as highlighted in the background papers, the benefits could be brought to the poorer communities and the capacity of the underprivileged within these communities to become potential users of ICT and participate in new economic ventures. However, this should be viewed not just as a business prospect but should be aimed at improving the standard of living of the poor population of the country.

While ICTs are hailed as powerful enablers for advancing economic and social development through the creation of new types of economic activity, employment opportunities and the enhancement of networking and participation, the advantages they are bestowing on the urban Indian are not reaching the rural citizens who are on the other side of the digital divide. This failing could be attributed to several factors. Using and benefiting from ICTs require education, training, affordable access to the technology, information relevant to the user and the building of an enabling environment, most of which the rural populace did not have. Rural geographies still remain unviable and unprofitable for many private players as they are characterised by low demand and consumption.

The demand-side components—including services, applications and content—are essential to promoting a vibrant broadband ecosystem. In the absence of relevant, useful and innovative

advances in the development and delivery of services, applications and content, there would be little or no demand for broadband, leaving the NOFN unutilised. In India, like in other nations, the more-affluent and better-educated populations generally have had earlier and better access to ICTs than the less-affluent and less-educated populations. The lack of broadband access, due to absence of connectivity or its affordability, could have a negative impact on the social and economic development of those who lack broadband access or do not understand the relevance of broadband-enabled services.

Enabling the Potential of Private Players: A study by KPMG and CII (2013) notes that, while the NOFN project would build a strong middle mile, for a sustainable and scalable ecosystem with viable and profitable business models around the relevant e-services for the rural masses, the core and last miles also need to be taken care of. For instance, e-education will connect the local population and the school system at the state headquarters level. This applies to the health sector as well.

This would require collaboration between the government and private sector enterprises to work out access strategies that make the proposition viable for all stakeholders. This, however, may be easier said than done. With multiple stakeholders owning the core, middle mile and access networks enforcing service-level requirements for applications like e-education to function would be a challenge. Public sector telecom operators may have come a long way from being monopolistic entities to market-driven operators with professional customer handling capabilities, yet the private operator owning and operating the access network would fight shy of giving service-level guarantees to e-service providers knowing that it does not have end-to-end control over the broadband network. Without any equitable service-level agreements (SLAs) in place, private e-service providers would be unwilling to venture into the rural geographies.

Kelly and Rossotto (2012) insist that investments or policies to foster or adopt broadband or policies are unlikely to produce significant GDP gains without complementary investments or policies in other sectors, such as education, innovation, e-governance and healthcare. Developing appropriate policies and synergies will largely determine the extent to which broadband affects the economy, serves as an enabling platform. Politics-based policies like favouring indigenous or public sector providers of equipment/services over international or private sector players with better technologies would have detrimental effects. This appears to be already visible, during the implementation where participation of private players is almost not observed.

From an economic standpoint, it is hoped that the recent foreign direct investment relaxations in this sector may spur more players to attempt to open up the vast potential in the rural markets. While the decision to use locally manufactured equipment could be an advantage in the face of the rupee plummeting against the dollar, other factors like delays and budget overruns may negate these benefits. While the original policy papers spoke of NOFN not being an area for private players to participate in and later statements from the

government deferred private equity in the NOFN for a later date, the inclusion of private stakeholders, with the inflow of private equity and technologies, is an imperative if scale and reach have to be achieved.

It appears that the earlier government was fairly categorical in its views regarding the role of the private sector in the NOFN. Very reminiscent of pre-liberalisation days, these monopolistic attitudes and attempts of the government to keep the private players out of the game may do little for society at large. The committee on its part has recommended that not less than 50% pairs of dark fibre at the gram panchayat level be set aside for allocation to telecom service providers, multisystem operators, local cable operators, internet service providers and other service providers through a forward-cum-reverse auction process. It has gone further to recommend that the determination of demand for bandwidth and the associated pricing should best be left to market forces while keeping a ceiling on retail tariffs to ensure affordability. However, the committee has refrained from making any recommendations on last mile connectivity except in respect to government services.

As of now, BBNL is focusing more on laying the infrastructure and forcing the state governments to undertake diffusion work. Though provisions exist for private service providers to participate, BBNL appears to be less aggressive in bringing the private players on board. There should be a beneficial policy environment to encourage private enterprise to develop business models for the rural customer. While the current thrust of the government is almost entirely on giving the supply push vis-à-vis broadband, creating the demand pull with credible public or private sector partners, and more importantly, making broadband conveniently accessible, affordable, applicable, acceptable and advantageous for the rural citizen will fast become the imperatives for the success of NOFN. As the committee noted in its introductory remarks, there is still a major lacuna vis-à-vis content creation for both government and private service. Mutually beneficial public-private arrangements need to be evolved for the creation of pertinent applications and content that would form the basis of this broadband ecosystem.

If NOFN roll-out is completed as scheduled, then all stakeholders would have to commence laying out their plans if not already begun. The onus of creating the business climate for the private players, and indeed, the ecosystem for all stakeholders lies with the government. Unlike the mobile services, where the telecom operators need to invest in infrastructure to offer services which is not viable, NOFN provides the fibre up to the gram panchayats and the broadband by the BSNL, the service providers have options to think of inexpensive technologies. For instance, cost of setting up a Wi-Fi hotspot for 2 km radius from a gram panchayat is Rs 45,000.¹³

The telecom sector as a whole has seen considerable instability with unwarranted political interference and frequently changing regulatory regimes. In order for this ecosystem to be established and expanded, a stable environment would have to be established. It is unclear how private players will be enthused to offer products beneficial for the society, in the absence of sound business propositions, would private operators

be ready to join the ecosystem and in their absence can the envisaged outreach really be achieved?

Sustained Political Support: Politically the NOFN will be a game changer bringing hitherto unreached population segments into the national fold, increasing both awareness levels and the quality of governance, the latter serving both as a cause and a consequence as well. However, in order for this to happen, political will on part of the powers that be would be required to either motivate or coerce stakeholders to extend their reach. As questioned by ITU in the case of the CSC programme (Shadrach and Sharma 2013), is there the political will and the requisite coordination between the central ministries and the state governments to establish this ecosystem? The newly elected government seems to be supportive of the programme.

Thomas (2012) infers lack of coordination or a forced one between state and central government. The article reports that BSNL had wanted the government to drive usage by undertaking e-governance projects in a big way, as there are few rural takers. Are the central ministries and state governments really ready with their G2C services? ITU in its assessment of the CSC programme (Shadrach and Sharma 2013), was critical of the lack of cohesiveness and ownership and little seems to have changed since. Whether it is banking services from public sector banks or e-governance services from line department, outreach plans and efforts have not happened despite infrastructure, though of lower speeds and capacities, being available.

While the new dispensation is committed to achieving its vision, as Digital India, and reflecting the same the committee has made recommendations with regard to the restructuring of BBNL with oversight from the concerned minister himself, the issues of coordination between the various stakeholders, despite the high level of political patronage, remain suspect. Nevertheless, at least seven states including Andhra Pradesh and Tamil Nadu which are ruled by regional parties who are not in coalition with the present government would like to implement the NOFN using their own mechanisms,¹⁴ inferring regional political support for the project.

Initial Impetus from the Government

For telecom players and content providers to see the necessary volumes to sustain this network, initiatives in mobilising and awareness building at the grass-roots level would have to be urgently formulated and undertaken. While the mobile revolution has done much in bringing home the benefits of technology to rural citizens and rendering it as a people-friendly tool, accepting e-services in place of traditional “touch and feel” modes would require a sociocultural change and this would be particularly challenging in sensitive areas such as banking and health.

It is not only critical that broadband access becomes available to the users but should be affordable and acceptable to them. Also, expecting constituencies like rural women to become users of broadband without any handholding or big demonstrations is unrealistic. Graduating from the simple cell phone to devices requiring smart handling by users requires a

giant leap. Much needs to be done by way of awareness building and training to have rural households accept and use broadband-enabled services. The inclusion of civil society organisations in this effort along with the administration, duly guided by a central nodal agency of the government, would help to achieve the necessary outreach.

Being a late starter in the telecom scenario, India has had the advantage of using the latest technology and so is in a better position when compared to many other countries as far as introduction of next generation networks is concerned. Broadband technology will, as discussed, enable several independent platforms like banking, health and insurance to converge their services to a rural household. Education, banking and e-commerce will, it is expected, boost entrepreneurial endeavours in both agriculture and other value chains. Apart from facilitating the spread of ecofriendly practices, it is expected that energy efficiencies in both the backhaul and access networks would be addressed using newer more innovative technologies. On the other hand, prolonged delays in deployment could bring technology closer to obsolescence casting doubts over its maintenance and requiring replacement.

Concluding Remarks

Given the full coverage of the nation, the anticipated impact of NOFN over lives of populace, especially poor, seems to be huge. As of now, the project seems to be repeating the mistakes of large projects or programmes India has been witnessing in the last few decades. As the number of stakeholders are many, including but not limited to local, state and central governments, and public and private firms, the relationship is complex and requires a great deal of adjustments from all parties to realise the potential. The dynamic market forces resulting from the ever changing business and political climate in contemporary India would also determine to some measure the future of this project. Unlike other organisations, BBNL appears to be aware of the challenges of its undertaking and is ably supported, at least on paper, by many studies or reports by the local agencies both public and private in spirit. The success of NOFN is dependent on the timely implementation, active participation by the private players and creation of complementary assets to realise the potential. The paper hopes that it is able to sensitise the policymakers of the same.

NOTES

- For more details, please see <http://csc.gov.in/>. The roll out status is here: <http://csc.gov.in/cscstatus/cscstatus.html>
- The details can be found at www.dot.gov.in/print/telecom-polices/broadband-policy-2004
- We are grateful to the anonymous referee for pointing out this gap in the manuscript.
- Broadband is defined as minimum download speed of 256 kilo bits per second (kbps) to an individual subscriber from the Point of Presence (POP) (<http://www.dot.gov.in/hi/node/68>). The limit has been increased to 512 kbps in July 2013.
- Teledensity is the number of phones (wireless + wireline) in use for every 100 individuals.
- For further details, <http://www.bbnl.nic.in/content/page/technology.php>
- <http://www.indiantelevision.com/iworld/e-commerce/we-have-done-a-terrible-job-in-broadband-penetration-rahul-khullar-140211>
- <http://www.lightreading.in/lightreadingindia/news-analysis/287469/bharti-airtel-row-delaying-lte-rollouts>
- This should not be confused with <http://www.bharatnet.net/> which is a private firm. It is quite interesting to see the identity of a programme of national importance, domain name, is not yet owned.
- "Government Completes NOFN Roll Out in 20,000 Panchayats," *Times of India*, 2 April 2015, available at: <http://timesofindia.indiatimes.com/tech/tech-news/Government-completes-NOFN-roll-out-in-20000-panchayats/article-show/46784050.cms>
- Identity is protected.
- Interview with an industry representative. Details on technology is available here: http://www.communicationstoday.co.in/index.php?option=com_content&task=view&id=14139&Itemid=48
- "Seven States in India Propose Their Own Broadband Network under BharatNet Programme," <http://tech.firstpost.com/news-analysis/seven-states-in-india-propose-their-own-broadband-network-under-bharatnet-programme-269113.html>

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