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Research and action agenda for a national broadband initiative in India

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Research and Action Agenda for a National Broadband Initiative in India	
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Abstract

Broadband has found to have substantial impact on the economic growth of various nations. Recognizing the positive impact of broadband, several countries have gone ahead with their respective broadband plans, which, at times, include requisite fiscal stimulus. In this paper we have tried to look into several of these international examples and have tried to put forth the challenges and opportunities that exist in a fast developing country like India. Based on these experiences, observations and analysis, this paper tries to bring forth recommendations towards a National Broadband Policy for India and suggests the objectives and structure of the same – thus setting a research and policy agenda for the nation. The findings of this paper may also provide necessary inputs to policy makers of such developing nations to formulate a similar broadband policy and management organization for them.

1.0 Introduction

Recognizing the positive effects of broadband on economic growth, several developed countries have not only focused on policy measures to accelerate growth and penetration of broadband, but have also included it as an area for fiscal stimulus, as in the US, Sweden, Japan and Austria. In all these cases, broadband has been seen as an integral part of the national infrastructure. Most of these plans seek to accelerate the linkages between existing networks and faster fixed line backbones comprising the Next Generation Networks.

In the case of developing countries, and similar to the effect of telecom on growth, the effect of broadband on growth is stronger than in developed ones and is more pronounced than that of mobile and Internet (Cohen, 2008; Williams, 2006). Such effects become even more significant, once a critical mass of users is reached.

The increasing gap between developing and developed countries, not only in terms of mobile coverage but also in terms of broadband penetration (Tajiri, Jitsuzumi and Okazaki, 2006; Williams, 2006), indicates an increasing gap in potential for economic growth. For example, broadband density in industrialized countries exceeded 25%, whereas in China, Malaysia and India it was 5.1%, 4.6% and 0.3% respectively. Further, within these countries there is a huge disparity between the metros, urban and rural areas. Increasing gaps in broadband deployment are seen as gaps in competitiveness of economies, and therefore, it is vitally important for India to develop a national agenda for broadband deployment, if it is serious about competing with other such nations.

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While private sector investments in all sectors of the economy should be welcome, a national broadband infrastructure in India, with significant public good characteristics, will require substantive public funding. This view is strengthened by looking at the developed countries, which have also invested in broadband through significant public funding (Ofcom, 2007; Cohen, 2008; Falch, 2007). In these cases, the funding for broadband has been through structural funds, regional support mechanisms and a variety of other instruments such as subsidies, funding innovative projects etc. (Picot and Wernick, 2007). In recent times, such initiatives have usually been undertaken in a Public Private Partnership (PPP) mode to leverage the efficiencies of private sector.

Internet and Broadband access are widely regarded as catalysts for economic and social development. A number of research studies have demonstrated the positive impact that Internet and broadband penetration have on national income (GDP). Recent World Bank research (2009) suggests that the contribution of broadband to economic growth is indeed substantial, and may be more profound than comparable narrowband or voice-based ICTs, providing a boost of 1.38 percentage points on GDP growth in developing countries for every ten percentage point increase in broadband penetration[1]. Accordingly, governments in the developed world have announced and implemented substantial plans to support high-speed broadband roll-out based on the premise that externalities associated with broadband deployment could be significant.

A critical evaluation criterion for effective broadband policy would therefore be valuation of the external benefits resulting from network deployment. But these external benefits are difficult to be quantified which makes the task even more complex. Broadband acts as a backbone in opening up opportunities for companies to explore new technologies, wider market, better communication and faster and wider access to information. It acts as a bridge between customers and companies across geographical boundaries. It also improves government accountability and the corresponding quality of service provision.Besides public services, broadband networks are being used more and more to deliver financial services, health-care, electronic voting, and electronic land-registration previously delivered manually.With these services now being automated and delivered over broadband networks, the unnecessary requirement of travel and physical displacement of goods has been significantly substituted. These apparent reasons compel active government participation and involvement in promoting broadband diffusion and demand by means of investing public funds.

Given this background, we undertook a study to understand need for such broadband policies at a national level and started looking at the various aspects that would point towards the gaps in the existing mechanisms. Our study showed that in India, not only does the government need to focus on the provision of a national broadband backbone but given the growth of mobiles, the role of mobile broadband in service provision is critical. However, due to challenges in other infrastructure provision (such as roads, ports etc), telecom services are seen as technological solutions that can wait, without recognizing the synergies that a good quality telecom infrastructure (including mobile broadband) could bring to infrastructure provision having a significant impact on the overall economic performance and hence, competitiveness, of the country. The objective of this paper is to develop the relevant research agenda and

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[1] What role should governments play in broadband development? Tim Kelly, Victor Mulas, Siddhartha Raja, Christine Zhen-Wei Qiang and Mark Williams, World Bank

an action plan for broadband deployment in the country along with an outline of a medium term action plan and a policy research agenda, covering identified current and future issues.

The rest of the paper is arranged as follows. In the next section, Section 2.0 we discuss theinitiatives of other countries in expanding broadband infrastructure to support the increasing demand. In the next section, Section 3, explains the various individual level and public and policy level drivers for broadband demand. And lastly section 4 consists of the conclusion and the recommendations of the paper.

2.0   Experience of Other Countries

Given the massive economic benefits of broadband and given its public good characteristics, it is hardly surprising that governments in several countries, especially developed, have adopted proactive measures to accelerate its growth of broadband penetration. While broadband infrastructure penetration requires fiscal stimulus or specific funds, utilization of broadband services requires creation of an ecosystem (Figure 1) which gets a fillip from the provision of internet based core government services, wider availability of broadband spectrum, and cheaper access devices.

Source: Adapted from Building broadband- Strategies and policies for the developing world, Yongsoo Kim, Tim
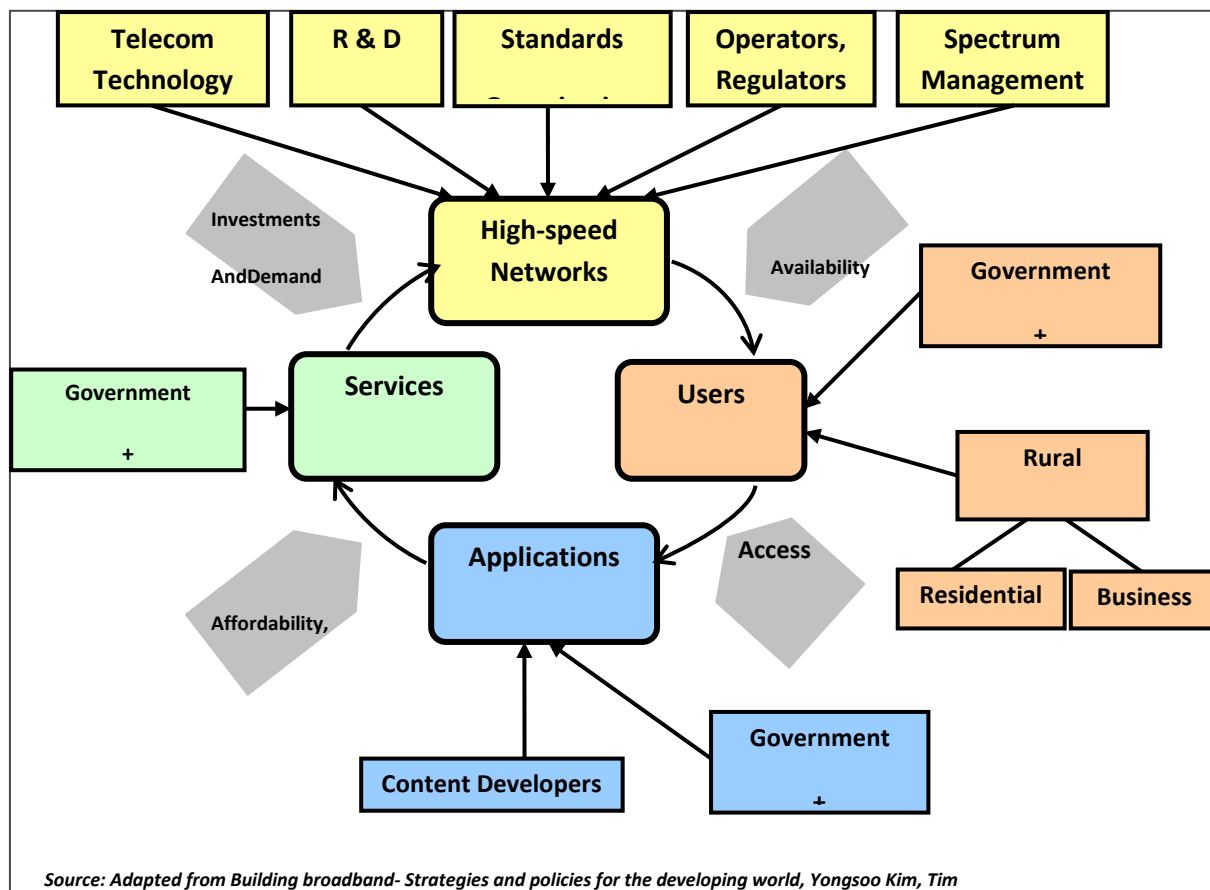
Figure 1: Broadband Ecosystem

While some governments, such as USA and UK began with a market led approach with respect to broadband, they found that their penetration indices were fairly low. Subsequently, there has been a

move to adopt more formal mechanisms. There have been two broad institutional approaches to broadband deployment: working with existing institutions through specific well-designed programs or setting up new institutional mechanisms.

Where existing institutions have been used for broadband deployment, a key aspect has been program design, which builds close synergies between the ministries/departments of telecom, IT, broadcasting, phase wise implementation, reviews and performance based outcomes. In Korea, the government enunciated IT/telecom based master plans stressing the need for greater deployment of broadband backhaul, informatization in the government through a variety of applications including deployment of a nationwide government procurement system (KONEPS), promotion of technology standardization and deployment of Ultra Broadband convergence Network (UBCN) that could seamlessly integrate wired and wireless infrastructure.

When new institutions have been set, these have emerged from ministries whose mandate is broader than management of telecom infrastructure. USA, UK, Australia are examples where broad scoped institutions already existed or new institutions have been set up for broadband deployment. In the USA, there is an existing Universal Service Administrative Company (USAC) that is the administrator for the USO funds. It not only manages network roll out to high cost and low income categories, but is also responsible for the telecom and Internet services to rural health care providers and schools and libraries. Thus, besides network deployment, it has a sectoral focus.

For its broadband Plan, the FCC has suggested that the executive branch should establish a "Broadband Strategy Council" to coordinate implementation of the Plan[2]. In Australia and UK, the governments have set up separate legal entities to manage broadband deployment. The Australian Department of Broadband, Communication and the Digital Economy invested in a National Broadband Network Company (NBN Co). To accelerate broadband deployment, UK has set up an entity called the Broadband Deployment UK (BDUK), based on the suggestion of the report on Digital Britain, Department of Business Innovation & Skills. It is interesting that the broadband initiatives are to be undertaken by the Department of Business Innovation & Skills and the Minister for Digital Britain rather than by OFCOM, as these are seen to have larger scope than just telecom and broadcasting that OFCOM regulates. The BDUK efforts would involve telecom, IT, and broadcasting sector, digitalization of content, protection of copyright, etc.

Broadband initiatives, have been funded by governments through a variety of instruments such as tax credits, regional subsidies and specially created funds. In Korea, funding was through various budgetary allocations to different programs. In the USA, besides the fiscal stimulus package of $7.2 billion parts of which were channelized through Rural Utility Services (RUS) and National Telecom and Internet Association (NTIA), the FCC proposes additional taxes on users. The UK government has set up a Universal Service Commitment fund with £200m from direct public funding, enhanced by five other sources: commercial gain through tender contract and design, contributions in kind from private partners, contributions from other public sector organizations in the nations and regions who benefit from the increased connectivity, the consumer directly for in-home upgrading, and the value of wider coverage obligations on mobile operators arising from the wider mobile spectrum package. The government also created Next Generation Fund to promote deployment of super-fast broadband. This fund included

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[2] www.broadband.gov

contributions from government and also additional fees of 50 pence per fixed copper line per month. This fund is to be given through tenders to the players deploying broadband[3]. The Universal Service Commitment will be delivered through the Network Design and Procurement Group, BDUK. The Australian government has invested $260 million in the NBNCo with a further $52 million committed. The government will issue private bonds to invite private sector participation.

Also R&D in the said areas would require government support in terms of policy, vision, prioritization of areas and funding. Based on the international experience we can learn from the FCC Broadband Plan for the U.S. which,got mandated by Congress as part of stimulus law. $ 7.2 billion was granted to ICT and Commerce. FCC would also issue recommendations for further deployment and use of broadband technologies. Recommendations were not limited to FCC alone, but also other government entities; also in case of Brazil (municipalities and city).

3.0   Demand Side Factors and Anomalies

The evolution of technology and increase in bandwidth is revolutionizing the lifestyle of many Indians by creating a new means of communication, knowledge sharing, governance, employment, business opportunities and through betterdelivery of services. Although Internet impacts various factors such as literacy, access to personal computers and electricity, it has made significant inroads in the urban market and is gradually making inroads to the semi urban and the rural parts of the country.

From FY05 through FY10, the number of Internet and broadband subscribers has increased at a CAGR of 23.9%20 and 117.5% to reach 16.2 million and 8.8 million, respectively in FY10. As discussed in the introductory section, broadband infrastructure plays a vital role in a country's achievement across domains such as social progress and economic development. According to Booz & Company[4], it is estimated that a 10%   increase in broadband penetration translates to a 1.5% increase in labor productivity in a country. Also, a 10 % increase in broadband penetration leads to a 1.3% increase in GDP. The following figure shows the growth of Internet and broadband subscribers in India.

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[3] Digital Britain-Final Report available at www.bis.gov.uk/files/file53061.pdf
[4] Bringing mass broadband to India: Roles for government and industry, Booz & Company, June 2010
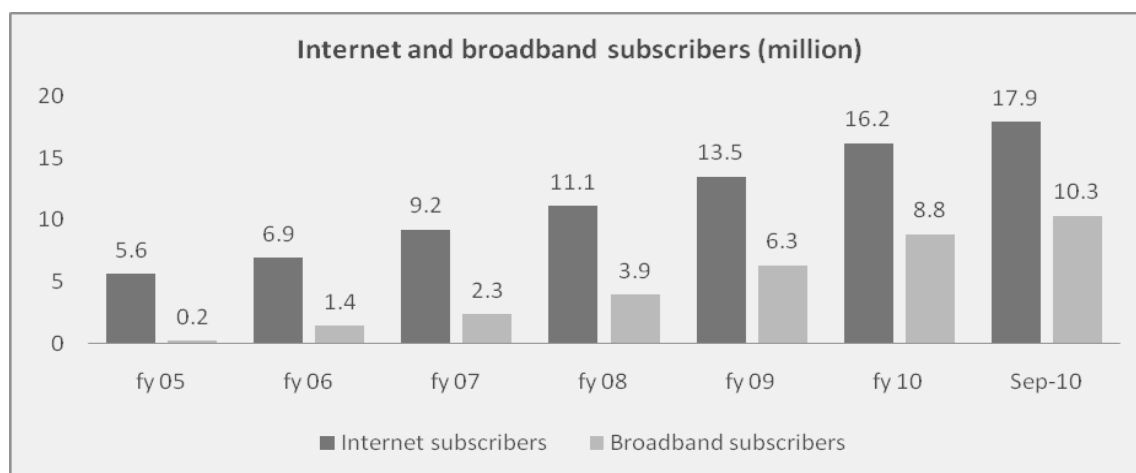
Figure 2: Internet and Broadband subscribers (million)

Source: TRAI

It comes out clearly from the above figure that the number of subscribers of broadband in India is growing at a faster pace than that of the other means of Internet access and in the period from FY 06 to September 2010, it has approximately trebled in subscription, albeit from a small base..

As clear from the ecosystem setup as shown in the figure 1 of this paper, there are several factors contributing to increasing demand for broadband both from the supply side (which would point towards maturity of the technology etc.) as well the demand pull, coming from end users as well as policy makers designing policies and programs that are dependant on broadband connectivity for their successful execution and achievement of the desired outcome. Hence, in terms of demand, it would be critical to understand how the demand has been evolving both for the individual users as well as various program rollouts.

3.1   Individual Level Drivers

The demand for broad bandat individual level is spurred from revolutionized lifestyle of the modern Indians that requires adopting new and faster means of communication, knowledge sharing, employment and delivery of services. There have been various drivers for the growth of this demand as analyzed below.

a.) Technological Drivers like convergence of technologies and ubiquitous use of IP networks, smart phones bundled with pre loaded features and inbuilt applications, Data cards and Wireless Broadband CPEs etc are technological innovation that permits new ways of creating, distributing, preserving, sharing and accessing digital content. As discussed above the usage of broadband has doubled over the past 5 years. Inexpensive smart devices in the market fuel the growth where more than 70% of smart devices cost less than $50 (retail price) in India. Availability of low cost mobile phones preloaded with various services like that of usage of Facebook etc. is also a considerable driver, especially in the urban and semi urban parts of the country. From 2005-09, the manufacturing and exports of telecom equipment grew at a CAGR of 33.9% and 112.1%, respectively in India. And according to industry estimates, the demand for telecom equipment is expected to be worth US$70–100 billion28 in 2015. Use of multiple devices like phones, laptops, handhelds, PDAs etc will also exponentially increase the usage of broadband.

b.) Economic Drivers like the increasing demand for usage of newer and better services like VAS and Internet on phones is driving the telecom service providers to look for cost effective and profitable solutions to meet the driving demand. VAS services include SMSs, listening to music, videos, watching TV online, Internet browsing, email, online gaming, video calling, m-commerce etc. The demand for mobile VAS is driven by the increase in the mobile subscriber base, which has exceeded the700 million mark, as well as aggressive marketing efforts by telecom operators to spread awareness about their services such as updates and alerts. The demand for mobile VAS is mostly driven by the youth, with India being one of the leading mobile markets for the young. The growth of m–commerce, which provides services such as mobile banking, mobile payments and money transfer, is also expected to drive the market for mobile VAS. Currently India is at a stage of high awareness and low usage stage of VAS services. The Market size of Vas has increased exponentially through the Years (Figure 3). The focus of a number of telcos in India has shifted from mere customer acquisition to customer retention through unique set of such mVAS applications, even for the low cost mobile phones. Interestingly, what strikes in the following figure (Figure 3) is the sharp rise of the mVAS market from 2009 to 2010.
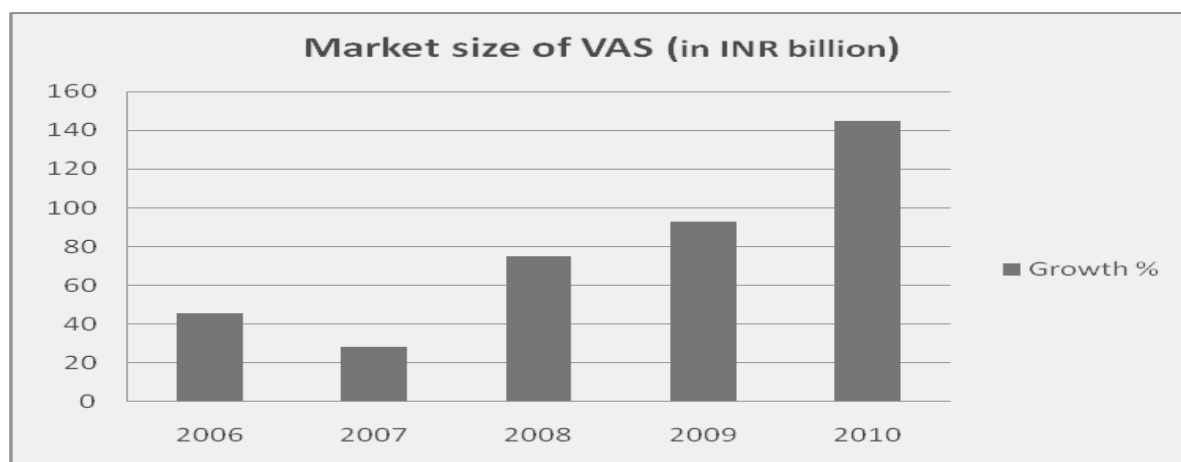
Source: http://www.pwc.com/en_IN/in/assets/pdfs/publications-2011/vas_landscp.pdf

Figure 4: Market size of VAS (in INR billion)

c.) Social and Behavioral Drivers The fast changing social norms due to busy lifestyles, lead to increasing use of e-mail, telephone, Internet, chat, and social networking, instant messaging etc. Social networking websites are continuously growing prominence in India. Within A year from 2009-2010 there has been a significant. India is ranked as the 6th fastest growing social media user community in the world - growth of 47% in 2010, twice as much as the overall growth rate of 23%, globally. Total use of social networking sites increased by 43% - from 2009 to 2010. -Facebook has around 45 percent penetration amongst Indian mobile users, while Orkut has around 20 percent. Given the accessibility of such social networking platforms even through low cost mobile phones enhances the usage of such services by the end users. Table 2 shows the increase in total unique visitors on social networking sites in India within a year.

Table 1: Social Networking in India: Total Unique Visitors (000)

Media Sites	Jul-09	Jul-10	%change

Social Networking	23,255	33,158	43
Facebook.com	7,472	20,873	179
Orkut	17,069	19,871	16
Bharatstudent.com	4,292	4,432	3
Yahoo!Pulse	N/A	3,507	N/A
Twitter.com	984	3,341	239
LinkedIn.com	N/A	3,267	N/A
Zedge.net	1,767	3,206	81
Ibibo.com	1,562	2,960	89
Yahoo!Buzz	542	1,807	233
Shtyle.fm	407	1,550	281

Source: http://paper.ijcsns.org/07_book/201102/20110225.pdf

This discussion clearly points out the increasing adoption of broadband among the end users in India, especially with the significant growth in the market size of mVAS. However, this growth in not without anomalies.The Broadband Policy of 2004 had envisioned around 20 million broadband subscribers by 2010, it is far from the 8.8 million actually achieved by FY 10. The explosive growth in mobile and Internet users in urban India is not supported due to underdeveloped fixed infrastructure and so is the missed opportunities in the semi urban and rural areas where broadband penetration is very less. Broadband penetration continues to be low rural Indiadue to lack of adequate infrastructure, inadequate content and application in regional languages, and most importantly lack of affordability and availability of broadband services.

3.2 Public and Policy Level Drivers

In addition to the individual demand for Internet usage, as has been discussed in the previous sub-section of the paper, there have been examples of large government schemes trying to extend e-government services to the citizens. Given the scale and scope of some of these initiatives, it becomes critical to consider this part of the demand side. The planning of such schemes and the initiatives to execute such policy level initiatives also point towards the dire need of connectivity that is required in remote areas for holistic and inclusive growth.One such example is the Common Service Centre initiative of setting up 100000 service centers across India such that it covers all 600,000 villages in the country.

Common Service Centres (CSCs) were set up to provide high quality and cost-effective video, voice and data content and services, in various areas of e-governance as well as other private services. Though CSCs were to be set up in the urban areas too, the major focus was to set up the CSCs in the rural areas in order to make government services accessible to even the most remote village. The CSC Scheme had been approved by government in September 2006 with an outlay of Rs. 5742 Crores over a period of 4 years. A typical CSC was to be a retail outlet of services that offered solutions based on a combination of ICT Infrastructure (PCs, Printers, Scanners, Digital Camera, Projection Systems, Tele-medicine Equipments,

etc.), rural entrepreneurship and market mechanisms. The CSC was established through a bottom-up approach and was customer centric and a single window for all G2C services and other retail functions.

The CSC scheme had been planned to be implemented in a PPP framework. This model envisaged a 3-tier structure consisting of the CSC operator (called Village Level Entrepreneur or VLE), the Service Centre Agency (SCA) that would be responsible for a division of 500-1000 CSCs and a State Designated Agency (SDA) identified by the state government responsible for managing the implementation over the entire state. [5] IL&FS was appointed as the National Level Service agency to enable the state-specific implementation plans to benefit from such economies of scale, aggregation of best practices, content providers, etc.

Though the Common Service Centre Project received approval on 31st Sept 2006 with a two year plan for roll out, most of the next two years -2007 and 2008 were consumed in sensitizing the various private players about the project, holding meetings with them and initiating the bidding process. In the year 2008, only ten states had started the roll out of the CSCs, summing to 14,216 centers across these states.

Private sector responded enthusiastically when advertisements were put for SCAs. More than 2300 organizations from across the country and with diverse backgrounds responded to this advertisement. Of the 2300 responses received, only 1120 organizations had clearly indentified the locations of interest; other responses were perhaps to grab the new business opportunity. Interestingly, among these 1120 applicant organizations, all the 591 districts had at least one potential applicant interested in establishing CSCs. The states and UTs for which no responses for the SCAs were received included Lakshawadeep, Daman & Diu, Dadra & Nagar Haveli and Sikkim, indicating perhaps perceived difficulties in making the CSC model run successfully in these states due to size, exogenous variables and overall business environment.

It came out that most of the states had not been able to meet the roll out deadline. At the start of this project it was stipulated that SCAs should achieve hundred percent roll out within 18-24 months after signing the Master Service Agreement (MSA) with the respective state governments. However the roll out status report of June 2009 showed that except three out of thirty five states and union territories, none of the states were even close to 100 percent roll out. This forced the government to keep revising the deadline.

Though the deadline was re-adjusted after the June 2009 review, none of the states (except the initial four that had already achieved complete roll out) had been able to achieve 10 percent roll out status. Even in June 2009 when the status of roll out was reviewed there were seventeen states that had not been able to roll out even fifty percent of the allotted centers. Also, given that the background planning and the selection of the agencies had been carefully done, this perhaps points to the fact that there have been critical problems in the setting up of the Centers. Out of the hundred thousand centers proposed by the Ministry of IT, as on June 2009, the number of pending centers stood at almost sixty thousand, which decreased to 45,686 centers in June 2010.

It is also noteworthy that even though a state had achieved decent roll out, it did not mean that all its centers were fully operational. The initiating idea of the CSCs were to provide a bundle of services,

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[5] http://www.csc-india.org/AboutCSCProject/ProjectDevelomentDocument/tabid/490/language/en-GB/Default.aspx

predominantly in the online mode that enabled provision of selected government services to the citizens along with providing other services. The following Table 3 shows a sample set of states with connectivity figures for the CSCs.

Table 2: Status of Connectivity of the Rolled Out CSCs as on June 2009

States	No of CSCs rolled Out	Number of CSCs with connectivity	Percentage of Connectivity
Assam	2001	1398	70
Andhra Pradesh	504	357	71
Bihar	4798	3162	66
Chattisgarh	928	521	56
Gujarat	5870	4472	76
Haryana	1159	1062	92
Himachal Pradesh	793	338	43
Jharkhand	4554	961	21
Meghalaya	81	34	42
Maharashtra	2365	806	34
Madhya Pradesh	5098	2469	48
Orissa	2054	1454	71
Rajasthan	325	0	0
Tamil Nadu	2873	2042	71
Uttar Pradesh	4485	3515	78
Uttarakhand	309	NA	NA
West Bengal	4962	3955	80

Source: www.csc-india.org

Though the state of Jharkhand had been successful in implementing 99 percent of its centers, only 21 percent among these centers had got any connectivity and the rest were made operational in offline mode. Some states on the other hand show a decent number in terms of connectivity. It is noteworthy that none of the 325 CSCs rolled out in Rajasthan till June 2009 had connectivity. Similarly in Uttarakhand, none of the CSCs rolled out till 2009 had any provision of connectivity.

That lack of connectivity is not the single inhibitor for the roll out of the CSCs becomes pertinent from the fact that in Haryana despite the 100 percent roll out and connectivity being available at 90 per cent of the rolled out centers, the project progress report as on April,2010 said that due to lack of G2C services and other financial problems only 142 out of the 1159 centers were operational.[6]

One pertinent reason for the slow roll out of these centers was the poor IT infrastructure of the states along with a poor governance mechanism and lack of a proper institutional framework for ensuring successful roll out. Some of the major issues for the CSC roll out being pointed out by the SCAs are that of lack of G2C services and poor connectivity. These issues, lack of proper infrastructure and lack of connectivity obviously becomes crucial. Without the presence of connectivity of any form, it becomes

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[6] http://www.csc-india.org/DIT/ProjectProgressReport/tabid/618/language/en-GB/Default.aspx

impossible to roll out online services, which combined with a lack of G2C services raises questions about the role of such CSCs across the nation.

BSNL broadband was the most desired form of connectivity. Substantial funds have been released to BSNL for providing connectivity, but its performance has been way short of what was envisaged. A number of the centers are admittedly located in very remote areas with no phone lines and therefore broadband cannot be provided there. BSNL had however agreed to provide WiMax in all such areas but that it still pending. The respective state governments should take the responsibility of creating a similar sense of urgency in BSNL along with a proper mechanism for addressing pending issues and monitor outcomes.

In view of the drivers and anomalies discussed above it is evident that there exists gaps both on individual level as well as public and policy level, which needs to be taken into account for deriving effective broadband policies in India. The broadband policies to be formed thus, should take into account three important factors – accessibility, affordability and attractiveness for both rural and urban Indianpopulation.

4.0 Recommendations

The broadband infrastructure being a public good requires huge capital investment during the set up phase, which can only be recouped over long term. Furthermore, since in rural areas, populations are dispersed, the demand per unit area is lower than in urban areas. In addition, the relatively lower per capita incomes and lower propensity to pay makes it commercially unviable for private enterprises. The network effect is also realized slowly as more and more customers latch on to the network, which makes sustenance of private players difficult, given the longish break-even time needed. Since the private players in such cases either respond late or do not respond at all to the demand, the anomalies of the market forces become prominent demanding state intervention in terms of subsidization and investment towards creating such an infrastructure. Lack of such infrastructure, on the other hand, makes the economy move into a negative vicious cycle, as has been the case so far in India and many such developing nations.

Based on the above discussion, a striking conclusion is that the government needs to take a broader perspective and focus on infrastructure as well as creation and nurturing of various elements in the ecosystem. Accordingly we recommend that for broadband deployment, an autonomous entity say the National Broadband Agency, India (NBAI) be created as a not-for-profitcompany, which should be headed by an eminent person from the private sector to ensure the quality and time of delivery. NBAI would be an independent entity with significant autonomy to set up various administrative mechanisms to ensure broadband delivery. The board should comprise members from various stakeholder groups like representations from the Department of Telecom, various industry associations in the telecom and IT sector, academic institutions, Department of IT, other infrastructure providers such as National Highway Authority of India, Indian Railways, Electricity Companies (network infrastructure providers), User Departments, NGOs etc. The Board members represent the diverse interest groups. The role of the agency would be to administer various programs for broadband deployment, including laying of new infrastructure. The NBAI would not make policy or regulatory decisions. The context of this agency is provided in Figure 2
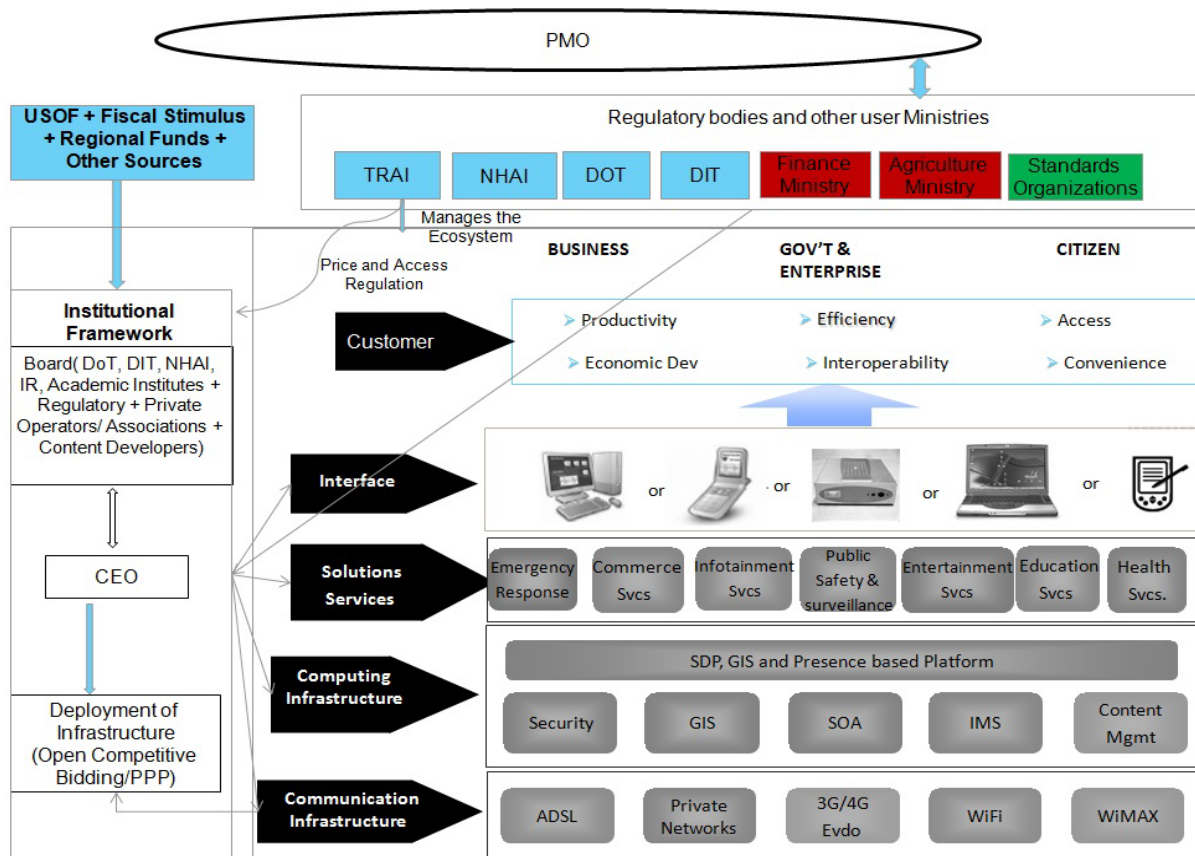
Figure 5: Institutional Mechanism for Broadband

In this context the Indian Telecom regulator (TRAI) would be required to develop a framework for access on non-discriminatory basis to all operators at regulated rates and at subsidized rates to educational and healthcare services. The standards for the equipment to be deployed on this backbone and the roles and responsibilities for creation and maintenance of such a network will need to be established. For rapid deployment of services, key e-government applications such as e procurement for government departments and high volume G2C applications need to be identified and mandated. The government should also focus on the development of low cost, low energy consumption devices, and provide initial funding support for development of content and content-based services. Capacity building activities to manage broadband networks and services will need to be provided. The important element in this national initiative would be the design, implementation and synchronization of the various elements. We suggest that this aspect needs to be taken up at the Prime Minister's level. In addition, we recommend that for broadband in India, USOF funds must be supplemented by other additional sources of funding, including from user departments, regional development funds (for example, Development of North East Regionwhich is economically backward, funds for tribal and coastal areas), financing through issue of bonds and fiscal stimulus funds.

And finally, infrastructure deployment needs to be accompanied by development of relevant local applications and services and as the CSC example has shown, creation of a proper institutional and governance framework. These have been identified in the proposed institutional mechanism above. Only with these complementary developments would we be able to leverage the broadband infrastructure fully

that can enable government, private and social sector organizations to integrate their social and commercial goals for the benefit of people in the remotest corners of the country through a combination of IT as well as non-IT services[7].

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[7] http://www.csc-india.org/AboutCSCProject/VisionMission/tabid/563/language/en-GB/Default.aspx

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