TELECOM REGULATORY AUTHORITY OF INDIA

Broadband India:
Recommendations on
Accelerating Growth of Internet and
Broadband Penetration

New Delhi

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Executive Summary of Recommendations

In April 2002, India was adding 0.28 million new mobile phone connections per month. Tariffs were high and fixed by the regulator, with only a couple of operators in each circle. Today, operators are adding almost 2 million new mobile subscribers per month, almost 8 times that of April 2002. Many regulatory steps were taken to arrive at today's scenario by allowing enhanced competition and reduced costs to benefit consumers. While not all steps were accepted instantly by operators or the public, today consumers and the overall market are in a much better situation.

Internet and broadband roll-out has the ability to have even farther reaching effects than the reforms in telephony did. Not only will broadband enable people to communicate with each other, but also to do business more efficiently over longer distances, be better educated, have access to better health services, benefit from better governance, and have enhanced entertainment services. Availability of broadband services at affordable price-levels will have significant impact on gross domestic product (GDP) and attract new investment, create jobs and a larger more qualified labor pool, and increase productivity through infrastructure creation and access to new and improved services.

While internet growth rates in India have been flat, and at times declining over the past three years, other countries like Korea, China and Malaysia have been doubling and tripling the size of their internet and broadband subscriber base. India currently has 0.4 internet connections and 0.02 broadband connections per 100 persons, while Korea has 25 and China has 1.4 broadband connections per 100 persons, with its current level 50% higher than what it was just six months ago. Korea has achieved its success story in a span of less than five years, going from less than 1 broadband subscriber per 100 persons in 1999 to the levels it has reached today. By 2002, nearly 30% of their GDP was transacted on broadband. The lessons that India learns from these examples can be applied to our current situation to realize the same explosive success.

In this document, the Authority has identified eleven major hurdles preventing growth of internet and broadband services. These hurdles include:

- Price
    1. Subscription prices of broadband services in India are 60 times higher than those in Korea, which translates to 1,200 times higher when considering purchasing power (Paragraph 1.8)
- Access to the customer in the last mile
    2. Lack of access to copper in the local loop and the high costs of duplicating this existing infrastructure (Section 3.4)
    3. Low quality of cable TV infrastructure and the lack of organization in that industry which makes upgrade difficult (Section 3.5)
    4. High costs of using DTH and VSAT technologies, and restrictions preventing them from being used for delivering broadband internet services (Section 3.6)
    5. Policies preventing terrestrial wireless solutions from being effective alternatives to bridging the last mile to customers (Section 3.7)
    6. Barriers in obtaining right of way clearances that are stalling network installation efforts (Section 3.9)
- Costs of backhaul networks
    7. High prices in domestic leased circuits, even though there are multiple competing players (Section 4.1.5)
    8. High costs of international leased circuits and problem with access to landing stations (Section 4.1.6)
    9. Ineffectiveness of NIXI thus far to be able to deliver on its objectives (Section 4.2)
- Fiscal policies
    10. Policies which prevent availability of low cost access devices, do not create incentives for further investment, and add direct cost to providing and purchasing broadband services (Chapter 5)
- Creation of content and applications
    11. The lack of locally relevant content and applications, especially for broadband, which is caused primarily by a lack of users and the absence of a "change-engine" to drive the growth (Chapter 6)

We have addressed these hurdles with twelve sets of recommendations for creating an environment that is more conducive to attracting investors, entrepreneurs and consumers to contribute to the spread of these services. These recommendations include:

- Definition and goals

    1. Broadband is an "An always-on data connection that is able to support various interactive services, and has the capability of a minimum download speed of 256 Kbps." This will be revised upwards in the future (Section 2.1)

    2. India can achieve 20 million broadband and 40 million internet subscribers by 2010, which translate to penetration levels of 1.7% and 3.4%, respectively. This is a bare minimum target and will need to be upgraded as progress is made (Section 2.2)

- Access to the customer in the last mile

    3. Enabling the use of the existing infrastructure on the incumbents' copper to reach customers via DSL (Section 3.4.2)

    4. Decreasing artificial costs in the operation of DTH and VSAT platforms, while allowing broadband services to be offered via these technologies (Section 3.6)

    5. Allowing terrestrial wireless solutions to spread more effectively as a means to reach customers with today's technologies, as well as those in the near future (Section 3.7)

    6. Enabling right of way clearance systems to be further streamlined for both current and future build-out efforts (Section 3.9)

- Costs of backhaul networks

    7. Allowing customers to realize the benefits of competition in domestic leased lines while compensating for the current lack of such competition in "within city" links (Section 4.1.5)

    8. Identifying the steps that need to be taken to make NIXI effective and attractive for ISP's of all sizes to willingly participate (Section 4.2)

- Fiscal policies

    9. Encouraging the availability of low cost access devices through depreciation, donation and recycling of used PC's (Section 5.3)

    10. Decreasing to the level of duties on mobile phones the current overall levels of duties for imported items used in broadband networks, and equalizing duties

on inputs and domestically manufactured goods with those that are imported (Section 5.4)

11. Providing the appropriate tax structure to enable faster growth, without the Government having to forego significant revenue (Section 5.5)

- Creation of content and applications

12. Outlining how the Government should proceed in being more aggressive in its efforts to create content and applications available online for interacting with citizens, and thereby serve as a leading example (Chapter 6)

Once these recommendations are implemented, India can reach broadband penetration levels that are 50 times where we are today within a couple of years. The growth that has been witnessed in a few years in India in the telephony space and in Korea in broadband, can be replicated and surpassed.

Chapter 1.   Introduction

1.1   Internet and Broadband access are widely recognized as catalysts for economic and social development of a country. Availability of broadband services at affordable price levels will contribute to higher GDP growth rates, provide for a larger and more qualified labor force, and make that labor pool more efficient.   Additionally, by promoting establishment of such infrastructure, social initiatives benefit because of the significantly reduced cost related to building access to citizen services, and the cost saved in training and educating users. While other countries, like the US, are speaking of delivering "universal, affordable access to broadband" for all of their citizens, India needs to quickly create the environment for stimulating explosive initial growth.[1] Without the right interventions, the current market offerings – dial-up connectivity of 20 hours per month for over Rs. 500, or wideband at more than Rs. 950 with high installation costs, limited download allowance, and low reliability and quality of service – will continue to prevail with benefits realized by only a few.

1.2   In April 2002, India was adding 0.28 million new mobile phone connections per month. Tariffs were high and fixed by the regulator, with only a couple of operators in each circle. Overall tele-density was also low. Today, operators are adding almost 2 million new mobile subscribers per month, almost 8 times that of April 2002, and tariffs for local calls have dropped 74% in the last year alone, with STD and ISD rates following a similar pattern. Many regulatory steps were taken to arrive at today's scenario by allowing enhanced competition and reduced costs to benefit consumers. Not all steps were accepted instantly by the various operators or the public, but today consumers and the market are in a much better situation. After seeing these explosive growth rates, the industry has accepted the challenge presented by the Authority of achieving 100 million mobile phones by the end of 2005.

1.3   Internet and broadband roll-out has the ability to have even farther reaching effects than the reforms in telephony did. Not only will broadband enable people to communicate with each other, but also to do business more efficiently over longer distances, be better educated, have access to better health services, benefit from better

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[1] "Bush Wants Cheap High-Speed Internet Access For All by 2007", Reuters, March 26, 2004

governance, and have enhanced entertainment services. India can not achieve its goal of a knowledge-based society without this.

1.4   It is universally accepted that widespread broadband adoption accelerates GDP growth. In 2002, IT, driven primarily by broadband rollout, accounted for 50% of South Korea's GDP growth rate.[2] An analysis by the Confederation of Indian Industry National Broadband Economy Committee shows that the total present value (2004) of benefit to the Indian economy due to growth from broadband is expected to be US$90 billion for the years 2010 – 2020, with an 11% additional growth in labor productivity. This activity is expected to launch new business lines and increased efficiency in existing businesses, leading to direct employment of 1.8 million and total employment of 62 million by 2020. These estimates are based on CII's goals of achieving at least 10 million subscribers by 2010 and 32 – 39 million by 2020.[3] The Authority is proposing higher goals in this recommendation.

1.5   A portion of these results will be derived from creating a larger skilled labor pool, and being able to draw upon more people since the need to have employees in central locations will be reduced. Another part of this economic impact results from the benefits that high speed data networks and internet access will have on corporate efficiency and success. Whether transacting between a business and a consumer, or between two businesses, the success of e-commerce transactions severely decreases with lower speeds. This is driven by the longer time taken to access and act upon information, and also the higher expense due to the current scenario of metered billing.

1.6   Even with tremendous growth in the information technology sector, overall ICT usage and penetration in the country has still lagged behind international averages. In India's quest to become a leading knowledge-based society, widespread adoption of ICT services, especially broadband will play a key role. Many countries worldwide have had success in driving growth in this area, as discussed in the Authority's consultation paper.

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[2] "The Growth of Internet Broadband Connections in South Korea: Contributing Factors", Dr. Heejin Lee, Dr. Kyounglin Yun, So-Hye Lim, Stanford University, September 2002
[3] "India's Broadband Economy: Vision 2010; Vision, Strategies, Recommended Action", Confederation of Indian Industry, Department of Information Technology and Department of Telecommunications, Prepared by IBM Business Consulting Services, March 2004

Key comparative indicators show that India still has significant scope to grow. Please refer to Table 1-1 below.

Table 1-1 – Key Internet and Broadband Indicators (End of Year 2003)[4]

	Parameters	Korea	Malaysia	China	India
Access & Infrastructure	No. of PCs per 100	*78.6*	*15*	*2.8*	*0.8*
	No. of cable TVs per 100 persons	*43*	*0*	*9*	*6*
	No. of fixed telephone lines per 100 persons	51	18.5	18.0	3.9
	No. of mobile phones per 100 persons	75	43.9	18.3	2.6
	GDP (US$ Per capita)	10,000	4,000	965	465
Internet	No. of internet connections per 100 persons	26[5]	12	2.5	0.4
	No. of users per 100 persons	65.5	34	6.2	1
Broadband	No. of broadband connections per 100 persons	25[5]	0.4	1.4	0.02
	Charges for broadband per month (US$)	30	29	16	20
	Charges per 100 kbps per month (US$)	0.25	7.61	3.07	15.63[6]
	Import duty on the customer premises equipment used for broadband	Local Made	----	Local Made	38 %

1.7   South Korea (henceforth Korea) continues to present a shining example of the results possible when the appropriate steps are taken to create an environment for growth, and the government and corporate sector work in partnership to deliver that growth. As recently as 1996, Korea had internet subscriber penetration under 2%, and broadband reached close to 1% penetration only in 1999. In the five years since, though, broadband has become a way of life for Koreans, and permeates everything they do. Today, almost

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[4] Source of table: China Internet Network Information Center; EMC Corporation, February 2004; IT Korea Journal, January 2004; ITU; Korea Network Information Center; Malaysia Department of Statistics; World Bank; TRAI analysis. Note: Numbers in *italics* indicate Mid-2003 values.
[5] Note: The values reported in the Consultation Paper of connections per 100 persons for Korea was based on household data, not subscriber data, and therefore was not completely accurate.
[6] Based on present rate for 128 kbps, with limited data transfer allowed each month

80% of households have broadband connections, and in 2002, US$148 billion, nearly 30% of their GDP, was transacted on the internet.[7] Please refer to Appendix 1 – Case Studies for more detail on this case study.

1.8   This success can also be replicated in India.   The CII has estimated that investments of at least US$2.6 billion by 2010 and US$5.35 billion by 2020 will be needed to achieve the goals they have set for broadband services.[8] This includes investment in urban networks, domestic and international backhaul, content delivery mechanisms, content and application development, and rural build-out. The content and applications would include a full gamut of services including education, health, governance, local language web content, and new broadband-based entertainment like games and videos. At today's levels, though, Indians are expected to pay 60 times more than subscribers in Korea for the same throughput, which translates to 1,200 times more when considering affordability measures based on GDP per capita comparison. For this magnitude of investment to occur, the appropriate regulatory environment and policies need to be established so that the discrepancy in pricing between India and Korea can be eliminated. Once this happens, only then will there be successful growth and business models in internet and broadband services.

1.9   Concerned about the stagnating growth of internet services and minimal uptake of broadband deployment in the country, TRAI issued a Consultation Paper on the above subject to solicit the comments and suggestions of various stakeholders. Open House Discussions were also held in Bangalore and New Delhi to solicit the responses of all stakeholders as well as the public. In addition, the Authority hosted a two-day workshop which included experts from various countries where broadband services have been a success, industry experts, and service providers to deliberate upon the applicable concerns.

1.10   The Authority has also taken extensive benefit from the CII National Broadband Economy Committee's study on promoting growth of broadband services in the country. This study has suggested regulatory measures to reduce bandwidth prices, allow access to

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[7] Korea Network Information Center
[8] "India's Broadband Economy: Vision 2010; Vision, Strategies, Recommended Action", Confederation of Indian Industry, Department of Information Technology and Department of Telecommunications, Prepared by IBM Business Consulting Services, March 2004

the incumbent's copper in the local loop, allow usage of internationally de-licensed spectrum, establish and mandate levels of quality of service in broadband and cable services, and promote efficient right of way agreements. Other recommendations included creating favorable fiscal policies in imports and local taxation, promoting rural build out with less rigid regulations, and promoting certain mechanisms in industry structuring, as well as others. A more detailed summary is in Appendix 2 – CII National Broadband Economy Committee Recommendations.

1.11 Additionally, the Authority has met with many pioneers in India who are using information technology access in villages to radically change the way and quality of life of farmers and their families. In numerous interactions with operators like ITC e-Choupal and n-Logue Communications, and projects like Gyandoot, they have demonstrated what they have been able to accomplish. Even in today's environment, many of these projects are accomplishing their goals in a profitable way. They would be able to be even more effective and reach more areas with implementation of the appropriate reforms. Please refer to Appendix 1 – Case Studies for more detailed case studies on these initiatives.

1.12 The Authority is providing its recommendations based on a review of all the inputs from the processes mentioned above, and including its assessment of the CII study and the views of various experts provided in numerous meetings.

1.13 It will be the Authority's endeavor to play a facilitating role in this very important field so that broadband and internet deployment in the country becomes ubiquitous and contributes significantly to the overall development of the nation.

1.14 The issues that needed analysis and clarity as inputs to formulating recommendations are:
- Definition of broadband
- Goals for the country
- Fostering roll-out via a multitude of access paths
- Cost reduction of infrastructure

- Fiscal policies for penetration of broadband services

- Aspects related to content and applications

- Commercial governance issues related to quality of service and tariffs

Chapter 2.   Definition of Broadband and Goals

2.1   Definition of Broadband

2.1.1   There is no universal definition of broadband. For the purpose of monitoring the growth of broadband uptake, as well as in the interest of consumers, each country needs to specify minimum characteristics of a broadband connection. Normally, broadband means a high speed, reliable, on-demand internet connectivity. Various organizations like the ITU, OECD and international regulators specify the minimum download speed of a broadband connection ranging from 256 Kbps to 2 Mbps or higher.

2.1.2   Most of the stakeholders, in response to the Authority's consultation process, have suggested that a broadband connection should be a fast enough, always on connection capable of quick data download along with video conferencing. The Authority also recognizes that while a definition for broadband speeds may be fixed today, it may change over time as applications and bandwidth needs change, meaning that broadband today could be narrowband tomorrow.

The Authority, after taking note of these various considerations and comments, recommends:

2.1.3   Broadband connectivity should be defined as "An always-on data connection that is able to support various interactive services, and has the capability of a minimum download speed of 256 Kbps." This definition for throughput may undergo upward changes in the future.

2.1.4   Based on this definition, QOS parameters will be separately established by the Authority.

2.2   Goals for Broadband and Internet Penetration

2.2.1   For the widespread availability of broadband and internet access, the consultation process solicited responses from stakeholders in respect to targets to be set for the next 5 years. Suggestions were made that at least 25% of existing copper local

loops (10+ million) should be converted to broadband connections. The ISPAI suggested an ambitious target for internet and broadband subscribers, basing their estimate on the proliferation of access technologies, new avenues to provide services, and significant decreases in the cost of providing these services and of access devices. On the other hand, the incumbent operators suggested a conservative target.

2.2.2   In this regard, the CII study's targets are in Table 2-1 below. The basis for their goals is a demand study they conducted through detailed qualitative and quantitative research. They examined the top 35 cities in India and segmented the market into households, SME's, SOHO's, corporates and cyber cafes, while also incorporating an aggregate projection for rural connectivity. The demand projections for the residential segment are based on a package comprising of 1.5 Mbps always-on broadband service with unlimited download. The optimal price was determined based on maximizing the return for broadband service providers matched against the demand curve that was generated from the research. This optimal price comprises of an up-front payment of Rs. 5,000 and a recurring monthly payment of Rs. 800, which consists of Rs. 600 for access costs, Rs. 100 rental for set top box and CPE, and Rs. 100 for broadband TV subscription. When arriving at these targets, CII envisaged coverage to start in the top 8 cities, and then spread to the top 35 cities by 2005. The smaller towns are only reached starting 2006, and by 2010, over 350 of them are expected to be covered.

Table 2-1 – CII Broadband Subscriber Targets[9]

Year Ending	Broadband Subscribers Target
2006	3.35 Million
2010	10.1 – 10.6 Million
2020	32 – 39 Million

Segment	2004	2005	2006	2007	2008	2009	2010
Corporate	46	107	175	249	328	414	505
SME	35	93	167	259	371	508	672
SOHO	15	41	80	135	210	309	436
Cyber Café	43	82	102	126	155	191	236
Household	747	1,479	2,838	4,327	5,601	6,727	7,596
Total	**886**	**1,802**	**3,361**	**5,095**	**6,666**	**8,150**	**9,445[10]**

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[9] Source of table: "India's Broadband Economy: Vision 2010; Vision, Strategies, Recommended Action", Confederation of Indian Industry, Department of Information Technology and Department of Telecommunications, Prepared by IBM Business Consulting Services, March 2004

(Subscribers in thousands)

2.2.3   As already mentioned, many other countries have well surpassed the current levels of India's penetration in broadband services, and even beyond the levels of what India would achieve by successfully reaching the goals suggested by stakeholders during the consultation process. Please refer to Figure 2-1 below.[11] While India strives to foster successful deployment in this area, these other countries continue to grow not just their penetration levels, but also the quantity and types of services offered over this medium. Even in the past 6 months, China and Malaysia have seen significant growth while India has been relatively stagnant for the past three years. Please refer to Figure 2-2 below.[12] Japan and Korea, as they approach possible saturation, have developed services that have changed the way individuals operate on a daily basis. Furthermore, they have found business models that allow them to realize revenues from these services that they deliver.

Figure 2-1 – Broadband Subscribers Per 100 Persons
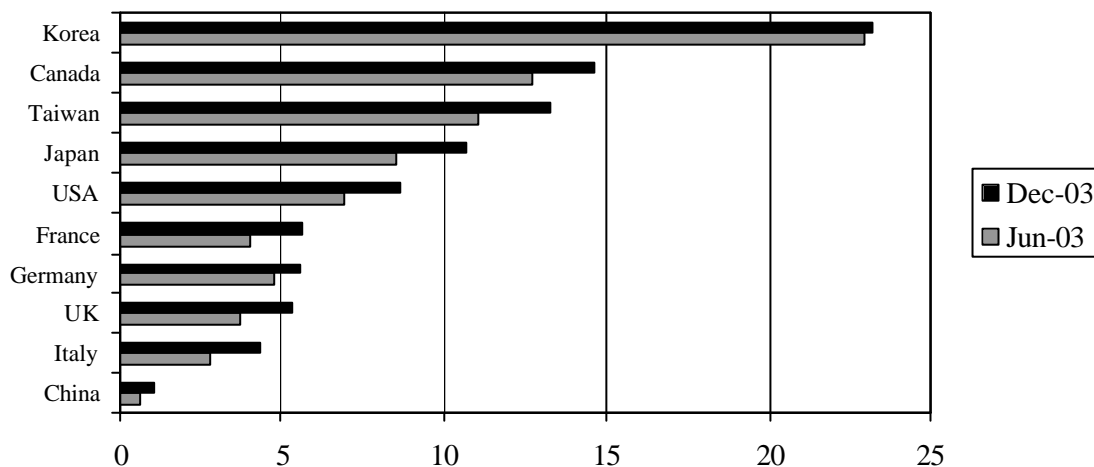
[10] Note: The remaining difference is covered by the number of rural kiosks and primarily by multiple seats at urban kiosks / cyber cafes.
[11] Source of figure: "World Broadband Statistics: Q4 2003", Point Topic, March 23, 2004
[12] Source of figure: "The Indian Telecom Services Performance Indicators Oct – Dec 2003, Telecom Regulatory Authority of India, March 2004

Figure 2-2 – Growth Rate of Internet Subscribers in India
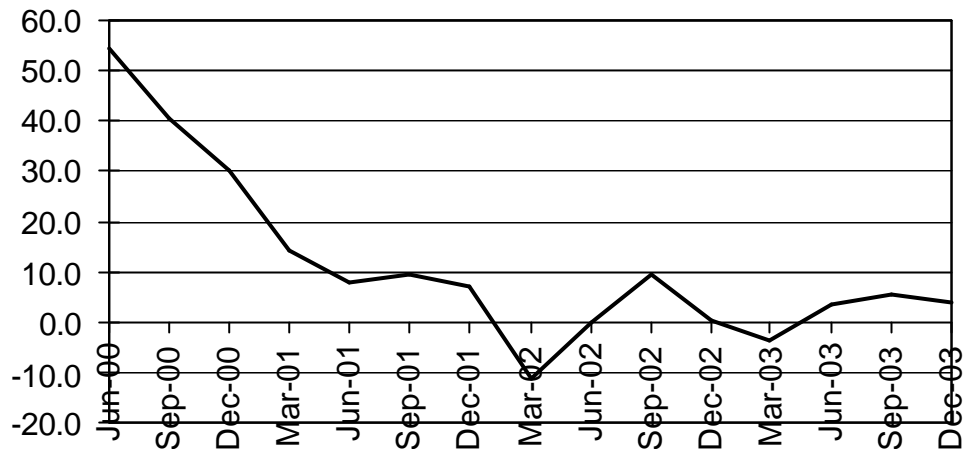
2.2.4   The objective of enabling the growth of broadband is to enable faster growth in GDP and delivery of social reforms, thereby increasing India's competitiveness in the international market. Therefore, we can not be too conservative in our targets. Simultaneously, we must also keep in mind the practicality of achieving the targets we suggest.

2.2.5   The Authority has considered these various comments and considerations in arriving at its recommendations. It is also felt that there is a need to catch up with international standards. BSNL has stated that they have plans to have one million broadband subscribers this year and we expect this to grow even more in the following years.

2.2.6   Furthermore, there are a number of other reasons that, according to the Authority's definition of 256 Kbps as the minimum speed for broadband, targets can be set higher than those set by CII's study. Based on the less stringent definition alone, the size of the home market for broadband would significantly increase. Since an offering of 1.5 Mbps with video included is towards the premium end of services, the demand would get larger as the price drops, even if speed of access drops. By removing broadband TV and dropping the speed, there are viable models at lower price levels. This is in line with the business models described by the CII. Therefore, the higher packages will attract the top of the demand pyramid, while lesser packages will cater to the more price sensitive. The enterprise market demand is not likely to change significantly because according to

CII's research the main driver for acquiring broadband services in that segment is faster and more reliable internet access. Additionally, they are less price sensitive than the household consumer.

2.2.7   In addition, CII has recognized that the possibility for discontinuous changes in the environment exists. This is one of the reasons why they have set their goals as minimum numbers. For the market research analysis, though, they specifically ruled out these types of changes because of the number of unknowns that it would introduce. Discontinuous changes could include a substantial drop in PC, access device, or CPE equipment prices, restructuring of the cable industry to deliver required QoS for high speed internet services, changes in technology and industry structure that lead to even lower prices, and the ability of operators to finance the Rs. 5,000 entry cost. While it is hard to assign specific probabilities to each of these events, the possibility of any single one of them happening is quite large. For example, financing entry costs has been demonstrated to already work well in driving demand in the mobile phone industry. Furthermore, costs per line in DSL and cable modem technologies have been declining at a rapid pace, with increasing speeds and distances possible. Even the cost of backbone elements like fiber and routers continues to drop. On the technology front, while there is no guarantee that any specific technology will succeed for mass broadband deployment, a number of possibilities may be less than 5 years away.

2.2.8   Finally, in the demand determination survey, the SME's and SOHO's that were considered to be part of the relevant market were those that had PC's with internet connectivity. While this is a good initial target market, in the longer run it is felt that the smaller businesses in this segment will be acquiring access devices specifically for broadband applications and services. This is especially true the advent of cheaper alternative access devices that are also geared towards local language and more specific broadband services access. This segment of the market is likely to see the highest efficiency benefits from utilizing broadband services through PC's and these newer access device models. Korea and Australia are already seeing new subscribers going straight to broadband access who have never before subscribed to internet services through a narrowband connection. [13]

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[13] "Birth of Broadband", ITU Internet Reports, September 2003

2.2.9   These factors combined with the possibility of a sizable drop in subscription rate due to TRAI and Government's facilitation increases the attainable market for 256 Kbps broadband services to 20 million by 2010.

2.2.10   Internet subscriber targets can be based off the broadband numbers. While historically broadband has always accounted for a small percentage of total internet subscribers, newer economies are seeing a shift away from that norm. As was cited earlier, Korea and Australia are already seeing users choosing broadband services as their first subscription to internet services. In December 2002, the top 10 countries in terms of broadband subscribers realized on average 14.4% of their total internet subscriptions from broadband.[14] While this seems a low percentage, newer growth countries like China and Korea saw tremendous growth in that value, reaching 17% and 96%, respectively, by the end of 2003, compared to 4% and 38% the year before. This is the likely path that India will take. With the low quality of service and high cost of dial-up connections, India's ratios are likely to be more in line with the trend that China and Korea are displaying than with the US (13% in December 2002), where there is high quality dial-up based on low cost flat rate access. Taking this into consideration, broadband subscribers in India are likely to be 50%, or even more, of total internet subscribers.

It is therefore recommended:

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[14] "World Broadband Statistics: Q4 2003", Point Topic, March 23, 2004; ITU World Telecommunications Indicators Database. Included countries USA, Japan, China, Korea, Canada, Germany, France, UK, Taiwan, Italy

2.2.11   The following should be the goals for broadband and internet subscribers in India.

Table 2-2 – Targets for Internet and Broadband Penetration[15]

Year Ending	Internet Subscribers Target		Broadband Subscribers Target	
	Number	Percent Penetration	Number	Percent Penetration
2005	6 Million	0.6%	3 Million	0.3%
2007	18 Million	1.6%	9 Million	0.8%
2010	40 Million	3.4%	20 Million	1.7%

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[15] Source for table: TRAI Analysis; Population based on figures from "India Vision 2020", Planning Commission, Government of India, based on P.N. Mari Bhatt, "Indian Demographic Scenario 2025", Institute of Economic Growth, New Delhi, Discussion Paper No. 27/2001. Population (millions) 2005: 1,093; 2007: 1,125; 2010: 1,175

Chapter 3.   Fostering Roll-Out via a Multitude of Access Paths

3.1   Worldwide, successful markets for internet and broadband provide consumers with multiple choices for their access providers. This allows them to choose the pricing and quality of service that best suits their needs and location, and provides the most technical feasibility.

3.2   For growth in broadband and internet access in India to be accelerated, this type of competition needs to be fostered and made viable. Today there are five primary types of access paths for bridging the last mile for broadband connectivity: copper loop, cable TV network, terrestrial wireless access, satellite communication, and fiber either directly to the home or to the building / community. The regulatory environment needs to ensure that each of these access paths co-exist in the most efficient manner possible such that no artificial hurdles suppress one technology. Though cable modem and DSL have traditionally been the dominant methods of access in other countries, each of these technologies has been able to grow and serve the purpose that is best defined for its characteristics based on the business models of the operators. During the consultation process there was wide agreement that bridging the last mile to the customer in a reliable and cost-effective manner is one of the largest challenges that need to be overcome to allow for rapid internet and broadband growth.

3.3   An environment where each technology is able to thrive leads to sufficient competition such that the price and quality offered to consumers will be attractive. Both of these, especially price are of utmost importance in achieving wide acceptance. Additionally, achieving the target for broadband subscribers will require enabling all of these technologies and operators to grow the market.

3.4   Digital Subscriber Line (DSL) on Copper

3.4.1   It is evident from the international experience that broadband using DSL will play a significant role in driving broadband growth in India. In European and Asia-Pacific countries, DSL accounts for 75% and 70%, respectively, of all broadband

connections on average. In countries like Italy and Germany it is as high as 100% and 98%, respectively. [16] Additionally, international experience shows that DSL succeeds when the incumbent follows the policy of providing the service in an aggressive manner, because the incumbent typically has ownership of upwards of 90% of the copper local loop. On average, it is the incumbent who provides the majority of DSL connections either itself or through resale/franchise. For example, in the EU approximately 80% of market share is directly provided by the incumbent, and a substantial portion of the rest through resale (please refer to Figure 3-1[17] below). Thus, the incumbents' role and effort are key to creating overall growth in the market. Even though local loop unbundling has a small market share, the stimulus of competition to spur the incumbent's efforts, however, is a significant part of the overall framework for achieving growth.

Figure 3-1 – Breakdown of DSL Lines by Type of Provider, March 2003
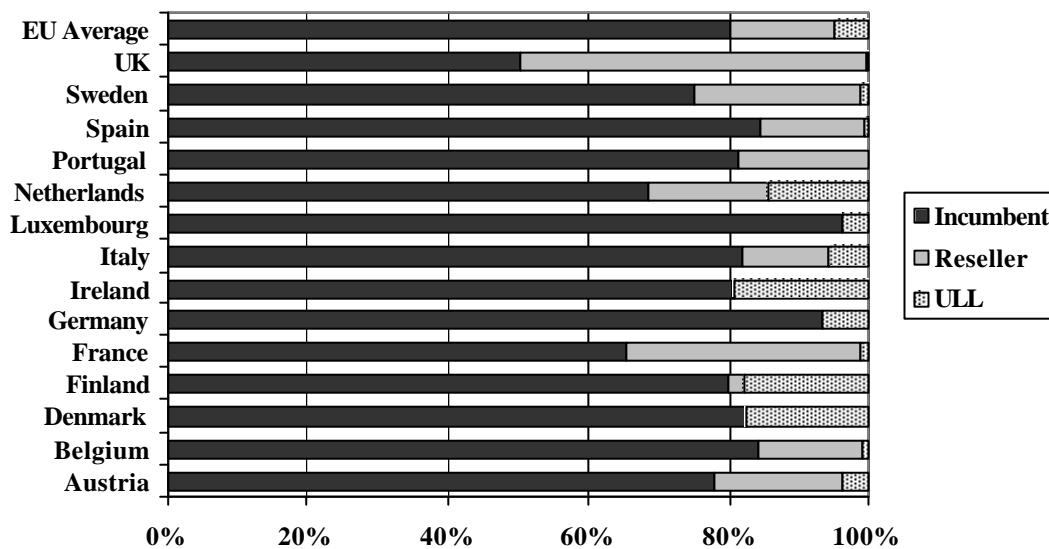
3.4.2   Local Loop Unbundling

3.4.2.1   In view of the above, it is important to have contribution and competition from other players for the incumbent to focus strongly on rapid roll-out of DSL services, and achieve the desired growth with the most value to consumers. Since virtually all of the copper local loops are owned by the incumbent, giving nondiscriminatory access to this bottleneck facility for use and investment by other operators becomes crucial. Introduction of competition has been adopted in nearly every nation which today has

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[16] Point Topic Ltd. 2003

[17] Source for figure: European Competitive Telecommunications Association (ECTA) DSL scorecard, April 2003. Note: ULL = Unbundled local loop

significant broadband penetration. The history of basic and mobile telephony market in India over the past three years also demonstrates the benefits that can accrue to consumers and the country as a whole when competition is allowed to exist.

3.4.2.2 Three types of local loop unbundling were considered both in the consultation process and during the workshop.

- Full Local Loop Unbundling (full access) - competitive providers have access to both voice and data on the line

- Shared Unbundling (line sharing) - competitive providers have access to either voice or data transmission on the line. In our context, since we are focusing on unbundling for the purpose of broadband services, we will consider this form of unbundling as providing network resources only for data transmission on the line, and not voice

- Bit Stream Access - the incumbent installs high-speed access links to its customers and allows competitive providers access to this link. In this arrangement, the incumbent own and maintains these access links

3.4.2.3 Feedback through the consultation process has suggested that over 50% of all the incumbents' copper lines can handle DSL services, though not all of them will be able to provide the highest throughput levels. The quality of lines in metros is expected to be significantly better than those in rural areas.

3.4.2.4 Our consultations show that, except the incumbents BSNL and MTNL, all stakeholders agree that non-discriminatory local loop access is required. The CII Broadband Committee's recommendations also favor local loop unbundling in the form of "Managed Access."[18] They describe this type of opening of the local loop being implemented via Shared Unbundling, with competitors allowed to provide data services over the copper local loop of the incumbents. CII also recommends that Full Local Loop Unbundling may be examined at a later date as converged services become prevalent and voice is able to be offered over data streams. They also indicate that access to Shared Unbundling may need to be governed by the regulator in terms of pricing and facilitation

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[18] "India's Broadband Economy: Vision 2010; Vision, Strategies, Recommended Action", Confederation of Indian Industry, Department of Information Technology and Department of Telecommunications, Prepared by IBM Business Consulting Services, March 2004

of collocation and access to the line. CII also points out that an element of revenue share and limited number of providers in an area should be part of the Managed Access program. However, one can not lose sight of the need for providing cheap broadband services. Therefore, pricing by the regulator needs to aggressive and in favor of the consumer, otherwise growth will not occur.

3.4.2.5 On the other hand, the reasons cited by BSNL and MTNL for not supporting local loop unbundling are the complications that this type of regime has introduced in other countries, without seeming benefit to the end-consumer, as well as the low tele-density levels in India.

3.4.2.6 The Authority has considered the problems with local loop unbundling that arose in two major markets, namely the United States of America and United Kingdom.[19]

3.4.2.7 In the United Kingdom, the problem caused during the initial implementation of local loop unbundling were based on high pricing for access, complicated procedures and terms for access to the local loop, British Telecom (BT) acting in its own interests, and economic environment of the industry. The regulator in the UK, OFTEL (which has later been incorporated into OFCOM), opened BT's local loop to competitive access in November 1999, but asked BT to define the terms and pricing of access. The terms that BT dictated created no incentive for competitors to enter the market as the costs were too high, and the process was too complicated with terms and price lists that ran dozens of pages. Furthermore, when approached to allow collocation for Full or Shared Unbundling, BT used delay tactics to stall the process. Very soon after the local loop was opened, the worldwide telecoms industry experienced an economic downturn, restricting the funds available to operators to invest in rolling out services. Additionally, the costs for DSL equipment were higher than they are in today's scenario, which meant operators had to make larger investments and take greater risks. Recently, OFTEL has intervened and rationalized pricing and access terms for accessing BT's local loop, and this has already had a positive effect.

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[19] Local Loop Unbundling Fact Sheet, Ofcom, www.ofcom.org.uk; "Local Loop Unbundling for Broadband Competition", Sidharth Sinha, IIM Ahmedabad, December 2003; "Competition in the Local Loop: Unbundling or Unbungling?", Telecoms Infotechnology Forum, July 2003; Birth of Broadband, ITU Internet Reports, September 2003

3.4.2.8   In the USA, many of the hurdles faced by competitive operators were similar to those of operators in the UK. The regulator, the Federal Communications Commission (FCC), unbundled the local loop in 1996. The same problems of high pricing and complicated access terms also faced the operators in the USA. Furthermore, since the regulator there was even earlier than the UK in mandating unbundling, technology was even more expensive and in its initial stages, causing the investments and risks to be taken by operators to be higher. Furthermore, the business models based on broadband had not been identified, especially as flat rate monthly billing for local telephone calls was the norm, and therefore dial-up internet services were quite economical and popular. Finally, since unbundling was implemented for all network elements, including newer fiber lines and networking equipment, the incentive for both incumbent and competitive operators to invest in new infrastructure was minimized. A ruling in February 2003 revoked this, and seeks to eliminate unbundling on infrastructure based on newer technology, like hybrid loops and fiber-to-the-curb. TRAI will have to avoid these pitfalls experienced in the UK and USA.

3.4.2.9   In light of the various issues concerning the three types of unbundling mentioned above and the international experience, a more detailed discussion is given below.

3.4.2.10 Full Local Loop Unbundling

3.4.2.10.1 Several issues were raised about the feasibility of ensuring smooth operations under the condition of Full Local Loop Unbundling in regard to possible friction between the operators and ensuring proper quality of service. Another reason that this method of unbundling is less attractive today is that there is not sufficient line capacity in the country, and therefore growth in the network through new roll-out needs to continue to be promoted. The incumbents' loss of the ability to provide voice services over their own lines would serve as a major deterrent to their incentives to manage, maintain and grow the network. Keeping these points in view, the Authority is currently not in favor of Full Local Loop Unbundling at this point in time.   Based on TRAI's experience in implementation, this decision can be reviewed in the future.

3.4.2.11 Shared Unbundling

3.4.2.11.1 In the situation of Shared Unbundling, the line is made available to another operator (the access seeker) only for data services. Since the objective is to achieve growth in broadband penetration, the unbundling of the switched voice portion is not being considered in the current context. This arrangement requires collocation by the access seeker in the incumbents' exchange premises in or near the MDF room. The issues which may arise due to implementation of collocation have been handled in different countries through the incumbent creating collocation hotels – an area either within or adjacent to the exchange which is allocated for use by access seekers under the provision of LLU, allowing direct access to the copper loop.

3.4.2.11.2 There are a number of advantages accruing to customers, and operators, including the incumbent, in Shared Unbundling. One of them is that investments can be made by access seekers to support the investments the incumbent is making, thereby distributing the load. Additionally, this allows faster roll-out to more places around the country as companies can allot their manpower to where it makes business sense for them, and thereby contribute to deployment goals. Also, a variety of technology can be deployed by access seekers so that end-users looking for specific applications of their DSL lines can purchase customized solutions where operators are willing to provide them. Finally, payments to the incumbent for this type access and collocation adds an immediate increase in ARPU for the incumbent without having to perform any significant investment or marketing efforts.

3.4.2.11.3 An additional factor to consider in this regard is that the main incumbent in India, BSNL, has successfully run trials of a modified version of local loop unbundling through commercial franchising arrangements in some cities. BSNL has discussed during the consultation process and at the workshop mentioned earlier, that it has significant plans to pursue the franchise model. The franchise model presently being adopted by BSNL is a modified form of Shared Unbundling, where the franchisee provides and operates the equipment while taking advantage of access to BSNL's local loop. Under the franchise model the service is marketed under BSNL's brand name. With Shared Unbundling not limited to franchisees, the service may also be marketed under the brand name that the (non-franchisee) access seeker chooses. The Authority considers the

franchise model to be important in the growth of broadband, but while this model provides significant opportunities to expand broadband services on DSL, it does not provide the much needed competition that ensures that DSL services grow quickly and in a way that is most beneficial to consumers. To achieve competition in the market, Shared Unbundling must be allowed.

3.4.2.11.4 The Authority considered the point that while Shared Unbundling is only for data services, one needs to address the concern raised due to the possibility of the access seeker providing voice services over those data services. The Authority is of the view that this is not a major issue at present, since the voice provided over the system would not be toll-quality voice, especially without significant investment in managed networks. If there was any growth in this market, it would remain for niche usage, just like existing internet telephony. The Authority also noted that currently inter-connection with the PSTN domestically is not allowed.

3.4.2.11.5 The above concern and position of the Authority regarding voice via the data channel would also be relevant for the next form of unbundling, Bit Stream Access.

3.4.2.12 Bit Stream Access

3.4.2.12.1 Bit Stream Access does not require collocation, except for maybe modem and/or router equipment for leased lines connectivity. This situation exists because the incumbent is responsible for creating the high speed access link to the customers' premises, and giving the access seeker the upstream portion of the data communication. There are three primary drawbacks with this implementation. The first is that it requires the incumbent to make the investments in hardware to make lines DSL-enabled in the exchange, which implies a large financial requirement from a single investing firm. The second disadvantage is that access seekers are locked into whichever technologies are implemented by the incumbent, and therefore can not provide customers with customized solutions or upgrade technology as it advances. This needs to be seen in the context that a variety of speeds and protocols can typically be offered today through the same hardware and there is no restriction on which IP-based services can be offered. Finally, the responsibility of maintenance, fault repair, provision, and all other servicing falls completely on the incumbent, giving very little insight or control to the access seeker in the actual provision of service to their customers.

3.4.2.12.2 There are, however, a number of advantages of Bit Stream Access. The first is that it simplifies the deployment process and requires inter-connection between access seekers and incumbents at the data stream level, not at the level of the physical copper. This also means that collocation requirements are virtually eliminated. Additionally, with deployment centralized at the incumbent, standards for DSL are likely to be maintained, allowing end-users to migrate with their CPE while maintaining inter-operability with exchange-side equipment.

Taking account of the above, it is recommended that:

3.4.2.13 To promote quick growth and create immediate competition in broadband services, nondiscriminatory local loop unbundling (LLU) should be executed in a time bound manner for both Shared Unbundling and Bit Stream Access. The owner of the local loop who is a unified access or basic services access provider (LL Operator) will have the opportunity to decide in which exchanges they want to make the investment to upgrade the infrastructure for their own use as well as for providing Bit Stream Access to access seekers. A list of such exchanges should be specified by the LL Operator for Bit Stream Access, with the expected date by which the facility would be provided. This list should be provided within one month of implementation of the LLU program. This information should be available in the public domain and regularly updated.

3.4.2.14 The Authority will undertake the LLU program in a time bound phased manner, with each phase being 3 months. For those exchanges in which the LL Operators choose not to provide Bit Stream Access (or are unable to provide) in the first phase of the LLU program, LL Operators should be mandated to provide Shared Unbundling and collocation facilities. The Authority will review the implementation during each phase and take action as appropriate to achieve the objectives.

3.4.2.15 The Authority expects that LL Operators would most likely find it easier to focus on extending broadband services through their own efforts or their franchises. The Authority is of the view that for introduction of a competitive stimulus, it is also

important to have non-discriminatory access by others to the above-mentioned unbundled local loop of LL Operators. The Authority would monitor the development in this regard, and expects that such opportunities would be provided by LL Operators to steadily increase the presence of non-franchisee access seekers during each of the phases mentioned above.

3.4.2.16 The Authority appreciates that when operators lay infrastructure for access (local loop), they have a right to get returns on their investment. To ensure that infrastructure expansion continues through fresh investment and based on international experience in this regard, the Authority would like to adopt a balanced approach to LLU. Therefore, the Authority would not insist on unbundling of new infrastructure which is less than five years old.

It is therefore recommended:

3.4.2.17 To continue to promote roll-out of new broadband-capable infrastructure, LLU will be implemented only for lines that are five years old from 2004-2005, the fiscal year of implementation of the LLU program. The same principle shall apply for all installations in the future once they complete five years. Therefore, all installations that were completed before the 1999-2000 fiscal year will be subject to LLU, and at the end of the 2004-2005 fiscal year, lines installed during 1999-2000 will be subject to LLU rules. LL Operators will be required to submit to the Authority within 21 days of the date of issue of these recommendations a complete list of all lines and thei associated year of installation into service. This will be used for public reference in implementing the LLU program. In the event that identifying the installation date of lines presents a problem in achieving the goals of the LLU program, the effective date for unbundled lines can be shifted to a later date. These parameters will be revisited in the future as the Authority performs its regular reviews on the progress of achieving the goals of the LLU program.

3.4.2.18 The Authority has specified its targets for broadband penetration in Table 2-2. The Authority is of the opinion that a successful launch of broadband would involve achieving more than one million broadband connections within the first year, with substantially larger additions in the following years.

It is therefore recommended:

3.4.2.19 If the broadband connections achieved in the first year are less than one million, then a review of the above specified arrangement would be conducted to consider other modes of local loop unbundling.

3.4.2.20 The Authority has also kept in view the problems that have arisen in certain countries regarding mandated pricing and access terms.

It is therefore further recommended:

3.4.2.21 The LL Operators are to provide the Authority their proposals on the appropriate conditions and parameters for access and collocation, including price and key performance indicators of service level agreements that will exist between the LL Operators and access seekers. This submission should be provided within 21 days of acceptance of these recommendations, and will be reviewed by the Authority in order to issue the final guidelines governing the details of LLU access and collocation. Additionally, the Authority will issue the details governing the system of allocating exchanges between the two types of local loop unbundling, including the timing for this process. The Authority will also include the terms and processes for converting an exchange declared by the incumbent to be of one type of LLU, but which the incumbent would later like to convert to another type. The issuance of these terms will mark the commencement of the LLU program.

3.4.2.22 The Authority also recommends that franchising arrangements between LL Operators and other parties should continue to be governed under mutual commercial agreements between the parties, as they are today, when the service that will be provided is provided under the brand name of the LL Operator. The Authority will allow levels of pricing for access and collocation in these franchising arrangements to be different from what is mandated for the terms of Shared Unbundling. In this sense, the Authority is not averse to brand name being treated as part of value.

3.5   Cable Modem Services

3.5.1   There are approximately 55 million Cable TV connections in the country. This last mile infrastructure reaches more people than even the telephone copper infrastructure, and can be leveraged in providing cable operators with a new business model while giving a stimulus to broadband penetration. In some countries, particularly in the USA and in Canada, the cable network is the dominant form of access for broadband services. In the USA cable modems account for 74% of broadband connections, while in Canada this number is 55%.

3.5.2   It was raised during the consultation process that the current state of the majority of cable infrastructure is not conducive to reliable high-speed bi-directional communication. Beyond just broadband internet services, this investment can also lead to providing upgraded television entertainment services such as digital TV with an interactive entertainment program guide, pay-per-view, and video on demand. Additionally, this enables operators to offer digital video recorders as part of set-top boxes to customers, allowing them to record, stop, rewind and even time-shift TV programs to their own liking. These types of services are growing at a rapid pace internationally, while also benefiting operators with significantly higher ARPU and better customer retention.

3.5.3   Today's regulatory environment allows cable operators to obtain an ISP license or partner with an existing ISP to provide internet services over their network. The Authority would like to encourage such initiatives as there is significant scope in this for supporting the existing business model of cable operators and positioning them for oncoming competition from providers of broadband and content services through other channels.

3.5.4   For advances to occur, though, investment in upgrading infrastructure and better organization of the industry will need to be executed. Additionally, the quality of service being provided needs to be raised. The traditional method of providing cable TV services allowed small local operators to spread and function profitably without any regulation. This environment has lead to the enormous reach and success of this sector thus far.

Going forward, though, market forces may require a certain level of consolidation and organization so that the required development can take place.

3.5.5   The network upgrade is an area of concern. The extent of that concern can only be quantified through a detailed study of the current state of the cable TV network architecture and what steps need to be taken to bring it to the required le vel for offering advanced services. The CII, in their recommendations, have conducted such a study, and have indicated that provisioning current cable TV networks to offer such services is equally competitive to offering DSL-based services over the existing copper local loop. They state that even though an upgraded cable TV network would have higher capital expenditure per subscriber (year 1 – US$743, year 3 – US$389, year 5 – US$337) than a DSL offering, the return on investment over 10 years is approximately the same – IRR of 21%.[20] This shows that the re is significant ability for cable networks to be a leading driver in broadband services roll-out. Some Multi-System Operators (MSO) and cable operators stated during the consultation process that they were already upgrading their infrastructure to provide better quality television and broadband internet services, and quickly seeing sufficient returns on their investment.

3.5.6   It was also raised during the consultation process that some cable operators were investing in installing CAT5 cables and Ethernet hubs along their cable routes to create a network on LAN-based architecture with many users connected over large areas. This type of investment has typically not resulted in reliable high speed services for customers, and is not sufficient to support the other upgraded television entertainment services described above. Further, because of its ad hoc nature, reliability has also been poor.

3.5.7   Furthermore, it was indicated by cable operators and consumers that there is need for training these operators to create awareness about the utility of their network for the provision of advanced services and relevant regulatory issues. Additionally, operators need an understanding of the investments required, the returns possible, as well as knowledge about the technical aspects. This process can be facilitated through training programs held by industry associations.

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[20] "India's Broadband Economy: Vision 2010; Vision, Strategies, Recommended Action", Confederation of Indian Industry, Department of Information Technology and Department of Telecommunications, Prepared by IBM Business Consulting Services, March 2004. Note: Values do not account for duties and taxes.

3.5.8   The Authority is working on a number of related issues, e.g., quality of service, in the context of developing regulatory policies for cable and broadcasting services. These issues will be further addressed in that consultation process.

3.6   Satellite Services

3.6.1   As referred to earlier, real growth in internet and broadband penetration occurs when choice between multiple data access platforms is available to consumers. Satellite based services offer an alternative to the copper wire or cable TV network for providing broadband and internet services.

3.6.2   VSAT Services

3.6.2.1 VSAT technology is another alternative, which could facilitate broadband penetration. The advantages of satellite based services are well known for remote or hard to reach areas and in situations requiring high reliability or multi-casting communications. Typically, outside of clearance delays, commissioning high bandwidth satellite connectivity can take significantly less time than other forms of last mile access methods. At the end of December 2003, VSAT services were provided by 11 service providers and there were 33,000 VSAT terminals.[21] There is a scope for further growth in VSAT's provided that some existing policy obstacles are removed so that VSAT services can become competitive with other prevailing broadband platforms. An installed base of over 700,000 VSAT's around the world in 2003, with over 56% of these in an area as networked as North America, demonstrates the significant applicability of this technology.[22] The VSAT industry has raised certain issues, which are causing impediments to the growth of VSAT network and services.

3.6.2.2 VSAT operators raised concerns about the increased costs they face by being forced to route their connectivity through ISRO, even while domestic broadcasters, ISP's and DTH providers are allowed to work directly with international satellites. This policy also locks VSAT operators into using older and more restrictive technology in most cases. VSAT operators have submitted that the current tariffs being offered by international

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[21] VSAT Services Association of India, March 2004
[22] Communications Systems Ltd UK, June 2003; VSAT Services Association of India, March 2004

operators, without accounting for special commercial arrangements for payment schemes, etc., would net a VSAT operator over 35% total costs savings per Kbps, which can be passed on to end-customers.

3.6.2.3   Even in VSAT deployments utilizing a foreign satellite, the hub-station would still be in Indian territory with the data being routed in India, and only going abroad through an international gateway.   This configuration should minimize any security concerns that may arise and alleviates the need to monitor each remote-station or the hub-station, since all international gateways already have regulations governing their monitoring.

It is therefore recommended:

3.6.2.4   An Open Sky policy should be adopted for VSAT operators, similar to what is available to ISP's and broadcasters.   VSAT service providers should be allowed to work directly with any international satellite.

3.6.2.5   We are of the view that service providers and end users should reap the benefits of technology to maximum possible level.   With improvements in the EIRP and G/T of new satellites, there should be no restriction on minimum antenna size.   The service providers should be free to decide the size of the antenna that would meet link design and technical requirements.   While reduction in antenna size may increase the interference level caused because of the increase in the size of side lobes, SACFA clearance would ensure that the interference levels are within acceptable limits.   Allowing use of smaller terminals also results in significant reductions in overall costs as the hardware is significantly cheaper and there is more flexibility in installation location.

3.6.2.6   Furthermore, there is a cap on the speed at which VSAT service providers can transmit data to a remote-station, while the technology allows speeds much higher than that.   Though the cap has recently been raised to 2 Mbps from 512 Kbps, there is further room for improvement as technologies today are already deployed that allow even greater throughput.   There is also a cap on the maximum throughput allowed for up-link to a satellite from a hub-station.   These restrictions on link throughput should also be removed.

3.6.2.7   Both of these cost and operational benefits can accrue directly to consumers, as well as create market efficiencies through competition among multiple providers for satellite capacity.

It is therefore recommended:

3.6.2.8   The regulation for a minimum size for a VSAT dish should be removed to allow operators further cost savings and increased operational efficiencies by taking advantage of available technologies. Additionally, throughput restrictions on VSAT services, for both up-link to the satellite and downlink to remote-stations, should be completely removed.   SACFA clearance should ensure that the interference levels are within acceptable limits.

3.6.2.9   The ISP license permits usage of any technology to provide last mile connectivity, including VSAT services, but the current parameters of the VSAT license require a new CUG to be made for every internet services customer that does not fit in a CUG. Furthermore, a remote-station is not permitted to be used as a distribution point for multiple customers, preventing it from being used in a commercial complex or multi-dwelling building or community to provide internet connectivity access to multiple customers.

3.6.2.10 VSAT providers could act as the connectivity mechanism between two ISP licensees, allowing connection with an internet gateway on one side, and connection directly with multiple end-customers on the other. Please refer to Figure 3-2 below for a diagram of this arrangement. This would allow the fixed cost of terminal equipment and installation to be shared among multiple subscribers, and quickly provide broadband internet services in areas that currently do not have fiber, cable or DSL operations running. This will also allow usage of VSAT as a back-up internet connection for those that need it. Furthermore, it allows cable operators who want to provide internet services another option for backhaul from their head-end / network node, ensuring they receive the benefits of competition in price and quality of service.

Figure 3-2 – Configuration of VSAT with ISP for Provision of Internet Services
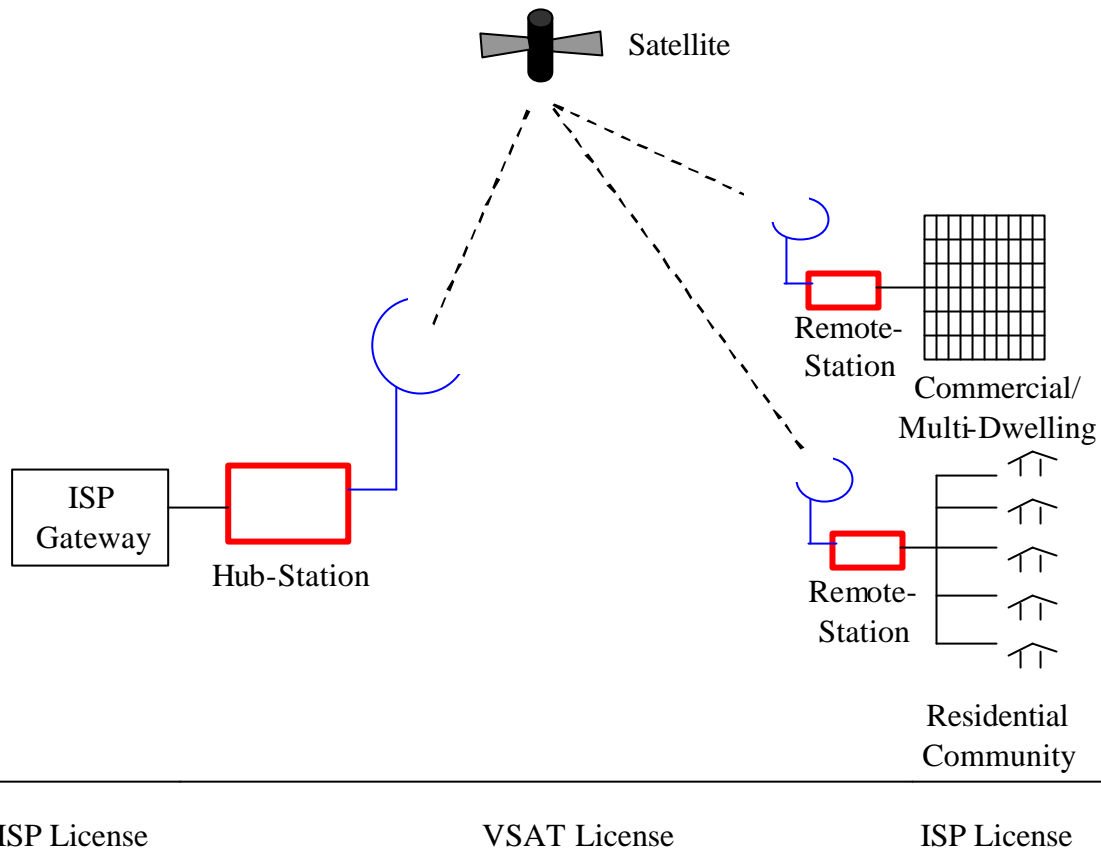
It is therefore recommended:

3.6.2.11 The license for VSAT operators should be modified so they may provide connectivity between multiple distinct telecom services providers, such as ISP's, using the same hub-station and remote-station and therefore also provide internet services directly to clients through their own ISP license. With an ISP license, a remote-station can thereby also be used as a distribution point and provide data services to multiple independent customers from that one station.

3.6.2.12 This recommendation does not intend to cover other services such as fixed PSTN and mobile voice, and does not envision any inter-connection with a PSTN exchange / PLMN network for inter-connecting voice services.

3.6.2.13 VSAT operators have also raised concerns about the process for commissioning both hub-stations and receive-only and bi-directional remote-stations. To further help

stimulate the growth of broadband services through deployments of this technology, there needs to be improvements in efficiency and predictability of establishing satellite installations. For this to occur, the current SACFA / WPC clearance procedures need to be enhanced.

It is therefore recommended:

3.6.2.14 After submitting all relevant documents to the WPC for SACFA / WPC clearance, the VSAT operator should be allowed to commence the installation process where the installation is on the grounds of an already authorized building and the total height of the installation is less than five meters above the rooftop, which is sufficient to allow for safe installation. If the VSAT operator's application is rejected by the WPC or is causing interference to any other system, even if it is at a later date after clearances are granted, then the operator can be asked to cease operations at that location. Alternatively, the operator may perform installation if the clearance decision from SACFA / WPC is not obtained within one month.

3.6.2.15 Finally, it is recommended that no SACFA / WPC clearance should be required for receive-only VSAT's if the location is on the grounds of an already authorized building and the total height of the installation is less than five meters above the rooftop, which is sufficient to allow for safe installation.

3.6.3   DTH Services

3.6.3.1   Deployment of DTH for showing TV channels has lately gained considerable urgency. DTH can also be utilized as the medium for last mile access for internet and broadband connections, though this is not permitted today. The uplink (connectivity to the ISP node) in this type of service would be an independent connection most likely through dial-up services utilizing a separate modem or a modem built into the satellite device. Therefore, the connection to the internet would have to pass through an already monitored international gateway before going abroad. Thus, security concerns can be easily taken care of on the outgoing side.

3.6.3.2   In the downlink from the satellite to the customer, there may be some concern for security if the hub station is located outside India. For addressing this concern, one

monitoring location in India could be insisted upon for all ISP licensees offering internet services through a DTH or receive-only VSAT. Since the downlink signal format for internet service is the same as that for DTH, this is feasible, and therefore the requirement for monitoring the downlink signal can be fulfilled with one monitoring location. Figure 3-3 shows a schematic of the communication chain in providing broadband services through this platform. Furthermore, since the DTH terminals would not be transmitting, there may not be a need for the NOCC fee, which is paid for uplink monitoring. Likewise, a receive-only VSAT can also be used for internet services.

Figure 3-3 – Receive Only Internet Service (ROIS) via Satellite[23]
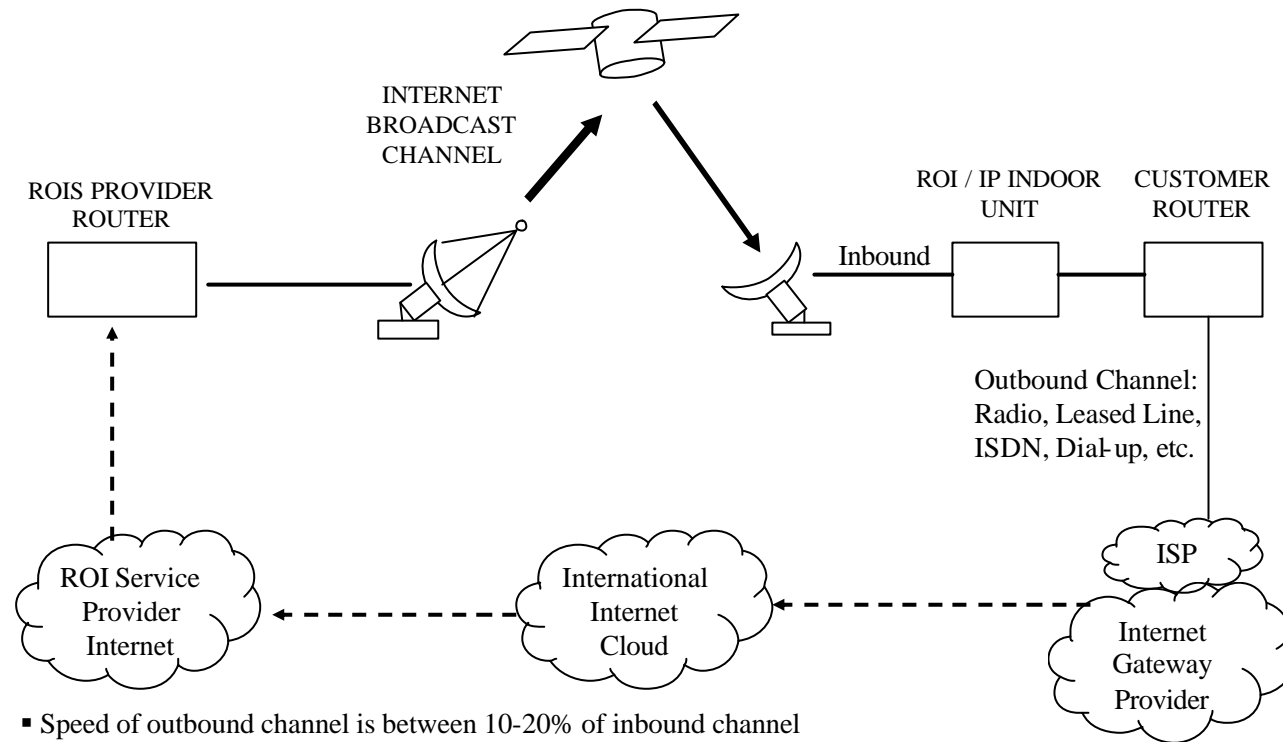
- Speed of outbound channel is between 10-20% of inbound channel

- Redundant connectivity on outbound is possible to be taken via ISDN, Dial-up circuit for improved reliability

- At outbound ISDN speed of 128 Kbps, incoming internet speed of 1 Mbps is easily supported

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[23] Internet Service Providers Association of India, Estel Communications Pvt. Ltd., March 2004

It is therefore recommended:

3.6.3.3 To enable Receive Only Internet Service via satellite, a DTH provider should be permitted to get an ISP license. The ISP license should be permitted to allow reaching customers for downloading data through DTH and other receive-only satellite services. Since this connectivity is through receive-only satellites, it should not require obtaining any further clearance or permissions from the WPC or SACFA if the installation is on the grounds of an already authorized building and the total height of the installation is less than five meters above the rooftop, which is sufficient to allow for safe installation. Furthermore, there may not be a need for the NOCC fee, which is used for uplink monitoring, and this service also should not lead to further levels of fees.

3.6.3.4   Operators also stated that the current license terms for DTH operators state that though any international satellite can be used for provision of services, paragraph 11.1 of the license states "proposal envisaging use of Indian satellites will be extended preferential treatment." Further, paragraph 11.2 states that "The Licensee shall ensure that its operation will conform to the provisions of inter-system co-ordination agreement between INSAT and the satellite being used by the Licensee." In practice, this policy is enforced in such a manner that ISRO will only allow operators to take capacity on foreign satellites when its own capacity is not sufficient, and even if using a foreign satellite is permitted, it is through the terms that ISRO has negotiated with the satellite services provider. This situation is very similar to what was discussed above for VSAT service providers. This issue is even more highlighted in the case of DTH service provision since transmitting a full bouquet of channels already requires a significant number of transponders. When additionally providing broadband services to a large subscriber base, the number of required transponders increases, and the operational parameters require that both video and data come from the same satellite for purposes of maintaining only one dish pointing in one direction at all times at the subscriber premises. Not having the ability to work directly with a variety of service providers limits the services and the number of subscribers a DTH operator can provision. Therefore, for these reasons, and the reasons of reducing operating cost and creating a level playing field with broadcasters

and ISP's who are already allowed Open Sky policy, the Authority feels that Open Sky policy should also be extended to the DTH operators.

It is therefore recommended:

3.6.3.5   An Open Sky policy should be adopted for DTH operators, similar to what is available to ISP's and broadcasters. DTH service providers should be allowed to work directly with any international satellite to ensure that a full extent of video and broadband services can be provided to a large subscriber base.

3.6.3.6 Furthermore, technology today permits ISP's to provide bi-directional connectivity via the DTH platform that has been established for television broadcast services by upgrading certain hardware in the platform.   The consultation process revealed that this is a new technology, but the present cost parameters available to us indicate that this may not be cost effective. This service is offered internationally, but has not yet developed significant market share. Currently, only the VSAT license allows for this provision of up-linking back to the satellite from a remote-station.

It is therefore recommended:

3.6.3.7 ISP's should be permitted to provide bi-directional data services to customers using the DTH platform, and should follow the same rules and regulations as recommended for VSAT providers.   This should be done while ensuring level playing field for entry and license fees in data services.

3.6.4   Satellite License and Spectrum Fees

3.6.4.1   Recently, other telecom service providers, such as CMSP's and BSO's, were given a 2% reduction in their license fees. Presently VSAT service providers are being charged 10% of AGR as license fee. In this light, VSAT operators should also be given a similar boost to help them reduce their cost of service. As with other operators, VSAT operators pay license fees on sale of hardware as well, since the AGR definition includes such revenues. While this revenue component may be small for other operators compared to service revenues, it accounts for a significant percentage of VSAT operators' revenues, and thereby increases the cost of the hardware.

3.6.4.2   Presently VSAT operators are also being charged 4% of AGR as WPC charges. Earlier, when the license fee of VSAT services was Rs. 50,000 per VSAT per annum then the WPC charges were Rs. 5,000. Since license fee had been reduced to 10% of AGR, it is recommended that WPC charges should also be reduced from the present level in proportion.

3.6.4.3   The use of internet over DTH becomes more expensive because of certain levies, all of which may not be justified. They must pay annual per transponder as spectrum royalty when up-linking to satellites from within India. Since the cost of usage of the transponder is paid for by transponder fees, the spectrum charge should not apply. Additionally, this cost is zero when the same is done from abroad, especially since the spectrum being used in this application does not block others from using it in the same geography. Furthermore, since up-linking from within India is a required part of the license agreement, DTH operators are placed in a situation where the services they provide to customers has to be more expensive to cover the cost imposed on them. The license fee of 10% for DTH operators should also be accorded the benefit of the recent reductions granted to other operators.

It is therefore recommended:

3.6.4.4   Though the issue of license fee for all telecom services is under consultation process, it is recommended that like for other operators, concession of 2% in license fee may be given to the VSAT and DTH operators also.

3.6.4.5   Furthermore, the definition of AGR for VSAT operators when calculating license fees should not include the sale of VSAT hardware that is required for establishing connectivity at the customer premise. WPC charges of 4% should also be reduced to 1% of AGR, in proportion to historical changes. In addition to this WPC charge of 1%, no other WPC charges like application processing fee, etc. may be levied.

3.6.4.6   Finally, DTH operators should be exempted from spectrum royalty fees for up-linking from within India.

3.7   Terrestrial Wireless Services

3.7.1   Another technological option for last mile broadband access is through terrestrial broadband wireless access.   There are a number of solutions that have been used commercially by operators internationally, while others are in test deployments.   These technologies include Point-to-Multipoint technologies such as Local Multipoint Distribution System (LMDS) and Multipoint Microwave Distribution System (MMDS), short distance high speed internet access services (IEEE 802-based) such as WiFi, Wi-Max, and also mobile cellular technologies such as IMT-2000.

3.7.2   Promoting Usage of Unlicensed Bands

3.7.2.1 Several attractive and cost effective options exist for providing terrestrial broadband wireless services, both with and without mobility. A prime set of standards are those in the IEEE 802 series.   Internationally, the spectrum required for these technologies are in the 2.4 GHz and 5 GHz bands. These bands are de-licensed and free for broadband usage in a non-exclusive, non-protection and non-interference manner. Furthermore, because of the low cost of IEEE 802.11 (WiFi) equipment and deployment, these technologies are very useful in many situations and make an excellent business case for operators to distribute broadband connections to multiple users within a limited distance. In India, the 2.4 GHz band has been de-licensed for low power, indoor and in-campus usage only, with limitation to a particular technology (IEEE 802.11b), while operators in other countries are already deploying WiFi as an alternative access path to cover entire neighborhoods.

3.7.2.2 The 5 GHz band is equally important, if not more, to de-license for outdoor usage because of certain inherent advantages it has due to the technology (802.11a) in that frequency. While the de-licensing of the spectrum should be technology neutral, one must consider the advantages that 802.11a has because it employs Dynamic Frequency Selection (DFS) & Transmit Power Control (TPC), giving it better spectral management and quality of service. DFS uniformly spreads channels across a wide range and enables 5 GHz wireless LAN devices to avoid channels on which other operators or radar systems may be operating. TPC reduces power across a wireless LAN deployment area by having mobile devices transmit reduced power levels when located close to access points,

reducing air interference, similar to CDMA technology. While 802.11b/g can only support a maximum of three non-overlapping channels in the same area in the 2.4 GHz band because each channel uses approximately 25 MHz, 802.11a accommodates 24 non-overlapping channels in the frequency that is allocated for it in other countries. If more than three operators using 802.11b/g try to operate in the same area, the overlap causes a performance decrease. Given the larger number of channels, and the DFS and TPC technologies, 802.11a will automatically seek out unused channels, and therefore can have better performance than 802.11b/g deployment. Furthermore, as use of this technology becomes more widespread, more operators will be able to be simultaneously supported without degradation in quality.

3.7.2.3   With the de-licensing of both bands for indoor and outdoor use, operators will be able to choose which sets of technologies best meet their needs. While 802.11a in the 5 GHz band may seem to promise better technical performance, the spread of technology in both bands is important to encourage internet and broadband roll-out, especially since migrating existing users from the 5 GHz band may take time.

3.7.2.4   New technologies such as Wi-Max, which have the potential to deliver above 4 Mbps over long distances in a fixed point-to-point or point-to-multipoint configuration, should also be encouraged. In anticipation of standardization of these technologies by the ITU, the spectrum should be de-licensed, in line with international practices, to allow India to take early advantage of such wireless technologies.

3.7.2.5   Internationally, WiFi is available in 2.4 – 2.48 GHz and 5.15 – 5.35 GHz together with 5.725 – 5.85 GHz. In addition to using these frequencies, Wi-Max is also likely to be available in 2.5 – 2.69 and 2.7 – 2.9 GHz and 3.3 GHz – 3.6 GHz.[24]

3.7.2.6   As per NFAP, 5.15 – 5.35 GHz is allocated for various services such as Aeronautical Radio Navigation, Radiolocation, Space Research, and Earth Exploration satellites. 5.725 – 5.85 GHz has been allocated for low power spread spectrum based

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[24] "Universal Broadband Wireless - The Role of Wi-MAX 802.16a vs 802.11 Standard", WiLAN Inc., January 2004

non-interference type systems. IND 58 mentions, "Such use will be on the basis of non-interference, non protection and non-exclusiveness".

3.7.2.7 The Authority feels that 2.4 – 2.48 GHz should be opened for outdoor usage immediately, with the same applying for 5.725 – 5.85 GHz. In the 5.15 – 5.35 GHz range, current users should be migrated to other bands as expeditiously as possible so that this band may also be de-licensed for indoor and outdoor usage to further boost the effort of internet and broadband deployment.

3.7.3 <u>Third Generation and Beyond Mobile Services</u>

3.7.3.1 Owing to limited reach and scope of broadband services, today there is not much demand for mobile broadband services. Once, the demand for broadband picks up, the demand for mobile broadband may also get accentuated. At that stage, services such as 3G and beyond will become attractive and affordable.   This would in turn further accelerate the rollout of broadband. The view on the timeliness of introduction of 3G services would get further clarified when the exercises on Unified License and Spectrum Policy are completed.

3.7.4 <u>Other Fixed Wireless Access</u>

3.7.4.1 To encourage innovation, especially at a juncture where we intend to move towards a more flexible licensing regime, it is important that we encourage wireless technologies in less congested bands. These could be point-to-multipoint services such as LMDS / MMDS or other alternates that can use the less congested spectrum bands, and for which the NFAP 2002 already has allocations.

3.7.4.2 In sparse and less populated areas, or even in metros during the early phases of roll out, operators may use FWA's to provide broadband services. In India, some of the BSO's had used MMDS to provide backhaul links, especially during the early stages of roll out. Some of the licensees are also using MMDS to provide high-speed internet access services. Internationally, MMDS has been used to provide video programming services and CATV.

3.7.4.3 Other operators, both ISP's and BSO / UASL operators are using CorDECT to provide internet services, with BSO's and UASL operators also using it to provide voice.

As mentioned above, spectrum related issues are being handled separately, in the exercise on Spectrum Policy. Although, to encourage the growth of wireless broadband services it is necessary that the NFAP should be suitably modified so as to ensure the efficient utilization of not only existing technologies, but even for new ones and new frequency bands.

3.7.4.4 Some operators have also started exploring the usage of Digital Terrestrial Television Broadcasting (DTTB) technology for purposes of providing broadband access. Since DTTB is like DTH, except that the transmission is from a terrestrial base station rather than a satellite transponder, similar technology and deployment as what is used in DTH can be used. The DTTB link would be used for the download of information to the customer, and a separate link would be used for requesting information. A 5 KW transmitter with a tower height of 175 – 200 meters can provide coverage up to 35 – 40 kms. Today frequency for such application is dedicated for broadcasting of TV content only, and Doordarshan has been allocated the bands. The WPC should consider allowing usage of the applicable spectrum for broadband services deployment as well. This should be explored as the technology becomes more mature.

3.7.4.5 There are two important aspects to the practical deployment of terrestrial wireless systems as last mile access networks. The first requirement is speedy deployment in the access network, which necessarily implies that the procedural delays for spectrum allocation, siting clearance and other formalities needs to be streamlined. The other aspect is spectrum charging levels and policy.

3.7.4.6 To address the first requirement, the ideal situation would be to have bands for broadband technologies, in addition to those bands discussed above in the 2.4 GHz and 5 GHz bands, de-licensed for broadband deployment purposes. Alternatively, if that is not feasible, then the quick implementation of the WPC's automation of spectrum management project should be accorded the highest priority and completed within a very short time. Until the automation of spectrum management process is completed, it should not be necessary to obtain prior approval from the WPC or SACFA for deployment of terrestrial wireless last mile access points in a network whose base station in the applicable geographic area has already received WPC and SACFA clearance, if it was required. This will accelerate the deployment of point-to-multipoint networks, which are

typically used when provisioning wireless access to a significant number of subscribers. The service provider should be allowed to proceed with implementation with the understanding that if the installation is causing any interference, it will be switched off. Point-to-point networks will still require clearance, but are typically used for backhaul purposes or specific commercial situations where there are a limited number of access points. In the situation that clearance is required, whether for new base stations in a point-to-multipoint network, or for access points in a point-to-point network, WPC and SACFA clearance should not cause undue delay in the deployment and installation of wireless networks.

3.7.4.7 The other factor which influences the practical suitability of terrestrial wireless systems as access technology is the manner of spectrum fee charging, as well as its quantum. In the spectrum pricing arrangements that currently exist for access providers, BSO's, UASL operators, and CMSP's pay approximately 2 – 4% of their revenues for the spectrum they use, and they are also accorded protection in the bands they are allocated. The quantum of the spectrum charges, spectrum pricing policy, and steps needed to promote re-farming of spectrum are very important issues in fostering the quick growth of broadband. These are being separately addressed by the Authority through the spectrum consultation process that is expected to be completed in the next two months.

It is therefore recommended:

3.7.4.8 The 2.40 – 2.48 GHz band should be de-licensed for low-power outdoor usage, and on the basis of non-interference, non-protection and non-exclusiveness. This de-licensing should be technology-neutral. Similarly, de-licensing should also be done for the 5.725 – 5.85 GHz band to facilitate deployment of Wireless Access technologies for broadband. Additionally, the 5.15 – 5.35 GHz band should be vacated expeditiously and de-licensed to further facilitate the objectives.

3.7.4.9 The system of frequency allocation, siting clearance, and licensing should be streamlined and made time bound by removing cumbersome procedural requirements and also by automating Spectrum Management through immediate computerization of the WPC.

3.7.4.10 In a point-to-multipoint network, once the base station has received WPC and SACFA clearance, remote access points within the same geography should be allowed to commence installation without WPC or SACFA clearance once applicable paperwork for obtaining clearance has been submitted, and if the installation is on the grounds of an already authorized building and the total height of the installation is less than five meters above the rooftop, which is sufficient to allow for safe installation. In the event that an installation causes interference, the operator should cease to operate that antenna. The WPC should respond to an application within one month of submission of paperwork, with reason for denial if the installation is not allowed, otherwise the operator can assume that the installation has not been contested.

3.7.4.11 IND49 of the NFAP 2002 which says: "Requirements of micro cellular WLL systems based on TDD access techniques, especially indigenously developed technologies, capable of coexistence with multiple operators…" should be altered to remove the reference to WLL. This should be done so that the link between fixed wireless and mobile wireless technologies, which remains because of the former WLL regime, is corrected for current technologies and bands, and future ones.

3.7.4.12 Furthermore, the WPC may explore alternative spectrum bands, which are not in the high demand bands, that could be used for deploying broadband services and develop pricing incentives for their usage.

3.8   ISP Last Mile Infrastructure

3.8.1   A major hurdle for last mile access through the existing infrastructure is the quality, reliability and suitability for higher speed, combined with the cost of upgrading and maintaining it.

3.8.2   Existing regulations permit an ISP to use any technology in their last mile access except for laying their own copper-based infrastructure. This artificial restriction is proving to be a hurdle for some of the ambitious service providers who can afford to invest in laying their own links to subscribers based on copper cables. This also prevents network architecture where high speed links are carried to the neighborhood or complex,

either via wireless, fiber or other potential high bandwidth carriers, and then are distributed to subscribers via copper in the last 100 meters using technologie s like VDSL.

3.8.3   Furthermore, this implies that the ISP license is not technology neutral because it inherently prohibits the operator from using DSL-based technologies, thereby possibly preventing the ISP to make investment decisions in what is most efficient for their operations.

3.8.4   The Authority had approached the DOT regarding this issue and stated the position of modifying the ISP license. The DOT has recently accepted this recommendation in its letter No. 813-7/03-LR with subject "Amendment of Clause 7.2 and Clause 7.5 of Schedule C part II of the License Agreement for Provision of Internet Service", allowing underground copper cable to be used by ISP's for establishing their own last mile links to customers.

3.9   Streamlining Right of Way (ROW)

3.9.1   Many operators, both private and public sector, stated that obtaining right of way clearances has proven to be a major hurdle in rolling out new infrastructure and providing advanced broadband services in a timely manner. These problems are based on the lack of uniformity in decision making processes of public and private right of way owners, availability of detailed GIS maps, and the need to create new ducting infrastructure to carry data cables, even in areas of recently completed civic projects. These issues also arise primarily within cities and towns where last mile infrastructure and within city networks are being installed by operators.

3.9.2   The government has in the past made efforts to improve the process for obtaining clearance, and has had some effect. The Authority is of the view that some additional steps are necessary to facilitate new broadband infrastructure build-out by decreasing delays and cost, and by ensuring that ROW decisions made by owners, whether the government or private companies, should be reasonable.

3.9.3   In Japan, operators initially faced problems when trying to bring broadband infrastructure into a multi-dwelling unit or complex, similar to what many operators in

India claim they are facing. The government there intervened when they saw that hurdles that building managers were creating were preventing broadband from spreading as it should. Furthermore, since residents were not aware of the benefits of broadband, they were not proactive in convincing building management to cooperate with operators. In December 2001, the government issued the Construction of the Partitionary Property Act, which dictated terms that made it easier for operators to enter buildings and install broadband infrastructure, defining this infrastructure as FTTH, FTTB with VDSL or HomePNA[25], FTTB with LAN, FTTB with FWA, and CATV. They also went further and in July 2002 the Ministry of Land, Infrastructure and Transport published manuals that laid out the steps for residents to obtain building approval to allow operators to install infrastructure in the complex. [26]

3.9.4   The USA also experiences a similar structure for control of ROW as in India. A mix of Federal, State and Local authorities control and manage different elements of ROW access. The FCC, in the Telecommunications Act of 1996, released amendments to previous communications acts which created a more level playing field for operators and enabled easier processes for obtaining ROW clearance for both public government owned property, and private property in multi-dwelling units and commercial complexes. The FCC mandated time limits for replies on ROW applications, and stated that detailed explanation needs to be included in case of denial. Their aim was to eliminate any unreasonable situations from occurring that would prevent telecom services from being delivered to customers. Furthermore, the FCC stated that ROW costs should be non-discriminatory, reasonable and publicly available for examination. Finally, the FCC also banned commercial complexes and operators from entering into exclusive agreements which would prevent other operators from servicing clients within that premises.

It is therefore recommended:

3.9.5   The Central Government should recommend to all State Governments that detailed GIS mapping should be required for all new infrastructure and civic

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[25] Note: HomePNA "is the high-speed, reliable networking (LAN) technology that uses the existing phone wires in your home to share a single Internet connection with several PCs in your home .", Home Phoneline Networking Alliance: http://www.homepna.org/). As of April 2003, NTT used the Ver. 2.0 technology that enables maximum 10 Mbps data transmission.
[26] "Promoting Broadband: The Case of Japan", ITU, April 2003

projects. These maps should be readily available when application is made for right of way clearance. Furthermore, these projects should include ducts for future insertion of data cables when appropriate. These recommendations should be then followed with legislation to ensure execution by the State Governments. The Central Government may consider mandating the parameters for such ducts and for accessing them.

3.9.6   Furthermore, the Central Government should recommend to all State Governments that they should actively consider giving right of way permission to operators in exchange for bandwidth provisioning to government offices. This arrangement helps bring the government online, benefits operators, and also saves the government from paying for access. These recommendations should be then followed with legislation to ensure execution by the State Governments.

3.9.7   It is also recommended that the Central Government should legislate parameters for provisioning ROW access for telecom operators in privately owned multi-dwelling buildings and residential and commercial complexes, and for installing ducts for telecom services in all new projects of this nature.

Chapter 4. Cost Reduction of Infrastructure

4.1 Reducing the Cost of Backhaul

4.1.1   There is significant correlation between the price of backhaul bandwidth and the price of broadband services that can be offered to customers. The backhaul, which consists of local data aggregation networks, metro area fiber collector rings, regional collector rings, nationwide domestic networks and international connectivity (please refer to Figure 4-1 below for an illustration), accounts for a significant portion of overall operating costs and is a large determinant of quality of service.

Figure 4-1 – Network Illustration for Internet and Broadband Traffic Flow

Last Mile:
1. Local Loop DSL
2. Cable
3. Satellite
4. Terrestrial Wireless
5. Fiber to the Home or Building / Community

Int'l Gateway

International Leased Circuit

Content Server

International Leased Circuit: For mirroring international sites, and for local sites that are popular abroad

Within City or Regional Ring: Local or NLD Circuit

Local Node

City or Regional Internet Router

Within City or National Network: Local or NLD Circuit

NIXI*

Within City or National Network: Local or NLD Circuit

Content Server

Content Server

Broadband Customer
- Internet services
  – e-mail
  – e-commerce
  – e-governance
  – tele-medicine
  – games
  – web surfing
- Local entertainment
  – BBTV and VoD
- Video conferencing

City or Regional Internet Router

Local Node

Data Center

Potentially Located in the Same Building

* National Internet Exchange of India. Currently under implementation
Note: Local and NLD Circuits can be over wireline, terrestrial wireless or satellite connections. International circuits can be via wireline or satellite

4.1.2   Today, the cost of bandwidth, both domestic and international, is higher in India than in other countries where ICT services have reached substantial penetration. According to feedback received during the consultation process, this cost can account for more than 45% of total monthly costs, making true broadband access, with acceptable quality of service in the backhaul segment, very expensive. Without sufficient backhaul bandwidth per subscriber, access speeds to the internet and other data networks are minimized, regardless of how fast the last mile link. Furthermore, if India is to target price levels for broadband services that will allow it to reach the high levels of penetration that are needed to give the country a boost, prices for backhaul will have to be below international benchmarks, and maybe even below prices calculated on the basis of Purchasing Power Parity.

4.1.3   CII, in its study, has carried out a detailed analysis of the impact of bandwidth prices on the final cost of broadband tariffs. As already stated in Chapter 2, on the basis of a demand study conducted by them for the top 35 cities, they have estimated an acceptable package to be the one where the ARPU is Rs. 800 per month. They have built a business model around this ARPU of Rs. 800 per month with a cash positive scenario being attained in the fourth or fifth year of operation. Simultaneously, based on the existing market rates for international and national leased lines, they have determined that on average for cities which are more than 500 kms away from Mumbai, Cochin, or Chennai (International Optic Fibre Landing Stations), the cost of the full transmission network works out to Rs.1,440 per Kbps per annum. At that price level, this cost contributes more than 80% of the operating cost. If, on the other hand, it is presumed that the cost of this transmission network decreases by 50%, it then accounts for approximately 61% of operating costs. Our calculations show that these costs remain the same even if the computation is done on the basis of market rates for STM-1 systems. Thus, it is seen that the business model, based on which CII has given its account of demand figures, fails unless there is a drastic reduction in overall leased line costs. In fact, in the CII model, further reduction of 25% in the second year has also been assumed. They have stated that the targets for sustainable price for backhaul (transmission network)

should settle at 30% of total operating costs. Thus, it is evident that reducing this cost element has significant relevance in ensuring growth of broadband services.[27]

4.1.4   Calculations conducted by the Authority by and large substantiate the CII observations. It is further seen that if international and domestic tariffs were fixed on cost basis, there is a scope for substantial reduction even over today's market rates. This applies equally to the international segment and national long distance circuits (domestic leased lines), even though operators are offering hefty discounts to the TRAI fixed ceiling for these circuits (there is forbearance on international circuit prices).

4.1.5   Domestic Bandwidth

4.1.5.1   Two components of domestic bandwidth come into play in determining the cost of the domestic segment of broadband links. One relates to "within city" networks and the other to long distance domestic networks. For all cities beyond 200 kms of the international landing stations, Mumbai, Cochin and Chennai, substantial contribution to expenses comes from the National Long Distance costs.

4.1.5.2   Extensive optic fiber cable networks – well over 400,000 route kms – already exist within the country. Aside from BSNL networks, the major approximately 180 cities are also connected by the networks of other operators. In terms of the local link, though, these are largely provided by the BSNL because other basic service operators have mostly utilized wireless systems for local connectivity. Normally, since there are more than four competitors in this space, one would expect that due to the effects of competition and the abundance of supply, prices would be lower. Since competition is typically the best way to introduce efficiency in a market and keep prices in check, there must be barriers that are preventing customers, whether other telecom operators or corporate clients, from realizing the expected benefits. These barriers should be removed, thereby bringing prices down, releasing increased amounts of capacity to the market and giving a significant boost to providing quality internet and broadband services at affordable costs.

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[27] "India's Broadband Economy: Vision 2010; Vision, Strategies, Recommended Action", Confederation of Indian Industry, Department of Information Technology and Department of Telecommunications, Prepared by IBM Business Consulting Services, March 2004. Note: Bandwidth prices based on lease of 2 Mbps circuit, and demand assumed to be constant when calculating IRR with increased price levels.

4.1.5.3   These barriers exist primarily because there is a limited competition in the "local segment" of a leased line, even though for some corporate customers the newer basic service operators have provided optic fiber based local links. The newer basic service operators, barring limited coverage by copper / optic fiber cables, have largely utilized the less expensive wireless-based networks to access residential and other commercial users. The wireless links used are mostly suitable for voice and, at best, low speed data, and therefore do not provide an attractive and feasible option for broadband connectivity. It is possible to use dedicated wireless links which can offer higher bandwidth, but these tend to be costlier and less efficient unless heavy usage justifies this expense. Wi-Max is a technology that could address this issue very cost effectively in the future, providing high bandwidth over long distances. Likely large scale deployment, though, is more than one year away. One is, therefore, left with the largely PSU-owned network for providing the within city links. The Department of Telecom (DoT), vide their letter No.824-42/2000-LR dated July 15, 2003 has issued a clarification regarding utilization of resources by CUG customers through multiple licensed service operators for establishing CUG networks. The contents are, in fact, equally applicable to the provision of a leased line wherein an attempt is made to provide the long distance segment of the circuit from one operator and the local segment from another. The first paragraph, inter alia, indicates that a leased line with circuits taken from different operators on different segments is entirely permissible and does not require any approval or permission from the DoT, and a latter paragraph indicates that this has to be done through mutually agreed commercial agreements between the operators. In a situation of near monopoly over local components of leased lines, the owner of the near monopoly segment can easily manipulate the market. Further, the letter goes on to state in the last paragraph that it shall be the responsibility of the operators to ensure that the telecom resources are used for genuine and lawful purposes.[28] This last paragraph unintentionally negates the overall context.

4.1.5.4   Suggestions have been made that the operator controlling the local segment must be mandated to provide connectivity to all long distance and other operators to ensure that multiple operator leased lines are in fact realized. Such a mandate could be carried out

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[28] Ministry of Communications & IT, Department of Telecommunications, Letter No. 824-42/2000-LR, July 15, 2003

through two possible approaches. One would be to incorporate it as a direction from the Authority or a modification by the Licensor in the License Conditions. The other approach could be to fix a ceiling tariff for the local segment of leased lines. The first approach is based on the premise of facilitated competition bringing down prices, while the second is based on price regulation through tariff ceilings. Both approaches have limitations due to the strong monopoly position of the incumbent PSU's. A combination of the two may work the best.

4.1.5.5 The limitations in this regard can be described with an example from the Government of Goa. The Government there is actively promoting ICT penetration and trying to attract businesses in IT services and ITES industries to establish locations there. The government has even initiated a program to give away PC's to its residents to promote higher ICT literacy. The biggest stumbling block that the Government faces in realizing better connectivity for potential businesses and residents is the lack of choice in infrastructure providers. Since their only choice of carrier is BSNL, they are not able to avail the benefits of competition. While RailTel does have capacity in Goa from Mumbai via the Konkan Railway network, with plans to further upgrade it to STM-16 in the next three months, the capacity is not accessible because of the above mentioned hurdles preventing its use.

It is therefore recommended:

4.1.5.6 Access providers of local segment of leased lines, for example, BSO's should be mandated as part of their License Conditions to provide local "within city" links to backhaul operators (NLDO's, IP-II operators, etc.), in a time bound manner, subject to technical feasibility.

4.1.5.7 Simultaneously, the Authority is examining the possibility of fixing new upper ceilings for the cost of national long distance leased lines and local leased lines that are lower than the current fixed rates, based on the most recent data available with the Authority.

4.1.5.8 Another area of concern in domestic bandwidth is the structure currently in place for revenue share license fee and minimum bank guarantee for certain operators. The

Infrastructure Provider Category II (IP-II) license was created with an objective to augment the available long distance communication infrastructure in India by enabling utility companies like Railtel, Gail, Power Grid Corporation, etc. to lease their spare transmission capacity to other licensed telecom operators. Though these utility companies have already built more than 50,000 kms of fiber optic networks, their capacity remains underutilized because of the problems being faced by them in getting the local lead from access providers, as discussed above, as well as the levy of license fees of 15% of their revenue.

4.1.5.9 The Authority had recommended to the Government that the license fee, which is 10% of annual gross revenue, as well as the 5% contribution towards USO should be completely waived with the aim of reducing the cost of domestic bandwidth in the country. In addition, it was also recommended that the bank guarantee of Rs. 100 crores required from IP-II operators should also be waived, as its purpose is diminished in a situation of no license fee. Thus far, the Department of Telecom has reduced the bank guarantee of IP-II from Rs. 100 crores to Rs. 5 crores but has not removed the license fee.

4.1.5.10 Levying a revenue share license fee on both infrastructure providers, such as IP-II operators, and on those using such inputs, results in cascading or double taxation for use of such facilities. Telecom operators who use leased lines from IP-II operators already pay license fees on the revenues generated from telecom services they provide by making use of those networks. These operators, who utilize infrastructure by leasing it, compete with service providers that use their own infrastructure to provide the same services and are not subject to a similar cascading fee structure. To address this anomaly, create a level playing field, reduce the price of bandwidth, and encourage development of additional infrastructure, revenue share license fee should not be charged for IP-II operators.

4.1.5.11 The Authority has already issued its recommendation to the DOT on the above topic. The DOT responded by pointing out that NLD operators also provide leased circuits to other telecom operators. The Authority, for the purpose of creating a level playing field, reducing the price of bandwidth, and encouraging development of additional infrastructure, as mentioned above, has stated that the same recommendations made for IP-II operators should also apply to NLD operators. This general principal,

created in the context of services provided by IP-II operators to other telecom operators, can also be applied to BSO's, UASL operators and ILD operators when they lease or sell bandwidth capacity to other telecom operators.

4.1.5.12 The governments of other countries like Korea who have successfully driven growth of broadband services have invested more than US$2.4 billion in creating sufficient domestic backbone infrastructure. In India, because of the availability of considerable infrastructure, the same level of investment is not needed at present from the Government. The steps mentioned above will reduce the burden on operators and result in the reduction of the cost of domestic bandwidth, create further incentives for infrastructure creation, and lead to overall reduction in the cost of broadband services in the country. The Authority has already sent its recommendations on this subject of license fee and bank guarantee to the Government.

It is therefore recommended:

4.1.5.13 The Authority's recommendations regarding waiving of license fees for IP-II should be considered expeditiously by the Government. Likewise, the issue of removing the bank guarantee for these operators should also be considered. Finally, the same principle should be extended to NLD operators, BSO's, UASL operators and ILD operators for the portion of revenue earned from leased lines provided to other telecom operators.

4.1.6 International Bandwidth

4.1.6.1 Another requirement for promoting growth of broadband is the availability of international bandwidth at low costs. This requires competition, which would be helped by opening bottleneck facilities at landing stations. The Authority is aware that substantial international bandwidth will become available from early next year, but it is important to address the demand for international bandwidth during the interim period. The Authority has conducted a number of meetings with stakeholders to address this important issue and additional bandwidth of 17 STM-1's will soon be available for users in India. With the increase in international bandwidth available next year, there will also be increasing competition. Until adequate competition emerges in the market, the

Authority views access to international bandwidth as a bottleneck facility and will take appropriate actions.

4.2 National Internet Exchange of India (NIXI)

4.2.1   In the Authority's exercise, which was completed in August 2002, on fostering growth of internet services in the country, a domestic internet exchange was cited as being one of the key factors to reduce cost and improve quality of service.[29] The purpose of the exchange was that internet traffic that originates in India and has a destination in India, should stay within India throughout its journey. Therefore, cost savings would stem from reduction in reliance on international bandwidth since ISP's would peer with each other within the country rather than going abroad, thus saving international bandwidth that is used to exchange Indian traffic. An exchange would also increase quality of service because the reduction in distance traveled would lead to fewer hops and faster download speeds. The Authority's "Report of Task Force on Growth of Internet in the Country" also gave a detailed business plan with parameters for operation of a national exchange.

4.2.2   The Department of Information Technology (DIT) established the National Internet Exchange of India (NIXI), and currently two nodes are fully operational, Delhi and Mumbai, with the third in Chennai coming online at present.

4.2.3   Internationally, countries that have substantial ICT penetration have invested in creating some type of national exchange. Most countries have initially heavily funded it from the government. Geographically smaller countries have the advantage that a small number of major nodes suffice, whereas in India distance plays a more significant role, thus requiring multiple points. Furthermore, some nations view connecting with the national exchange as a part of their inter-connect policy, and therefore the regulator governs the rules overseeing this.

4.2.4   It has been observed that the response from the ISP's about their willingness to join NIXI has not been very encouraging, and the NIXI board is of the view that the

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[29] Report of Task Force on Growth of Internet in the Country, TRAI, August 2002

Authority should mandate ISP's to interconnect with NIXI by making a suitable amendment in their license. The DIT has also expressed a similar view. The operators have indicated that the reasons for their lackluster responses have included issues regarding infrastructure, equal flow of traffic to prevent certain operators from having a free ride on others' infrastructure, separation of international, national and regional traffic, governance, and the participation of the largest players.

4.2.5   The Authority is of the view that for ISP's to have incentive to join NIXI and thereby allow the country to realize its benefits, the appropriate infrastructure and processes must first be established to address the issues mentioned above. The conditions need to be created first, and then ISP's will be more willing to join and direct traffic towards the exchange. Issuing a mandate for ISP's to connect to NIXI nodes at present would only serve to further raise the cost of ISP operations, and therefore raise the cost of broadband and internet services for the consumer. If after creating a suitable environment in NIXI ISP's do not join, then the Authority would consider mandating connection through inter-connect regulation.

4.2.6   Currently the 15 member Board of Directors of NIXI consists of representatives from DIT, DOT, STPI, ISPAI, GIPI, some ISP's, and independent representatives who do not represent a stakeholder. Over the past few months, they have been trying to refine the overall business plan of NIXI and address some of the issues the operators have raised. A smaller group, representing operators and independent representatives were able to arrive at solutions which would deliver both technical and economic viability to the NIXI model and its participants, while also delivering the intended benefits of boosting internet and broadband growth.

4.2.7   The structure, which is supported by the Authority, will start with four independently located NIXI nodes, the three current ones with a fourth in Kolkata. The number of nodes may expand in the future as volumes increase and creating new locations would offer benefit to internet and broadband initiatives. With India divided into four regions based on the four nodes, ISP's in those regions would connect to their regional NIXI, not necessarily to each NIXI. For the ISP's that have presence in more than one region, they would only open routing to receive traffic from other ISP's whose destination is in that region. Any ISP intentionally trying to route traffic with

international destination through a NIXI node would be blocked from participation. This would prevent misuse of larger operators' infrastructure as both international and national traffic would have to be carried over infrastructure which the ISP has paid for. For example, while Dialnet Communications, a Delhi-based ISP, may only connect at the Delhi NIXI, VSNL or Sify would have to connect to each of the four because of their national presence. Furthermore, when a Sify customer in Delhi wants to retrieve information from a website hosted in a VSNL data center anywhere in the NIXI-defined Mumbai region, Sify would bear the responsibility of carrying the traffic over its own infrastructure from the customer in Delhi to the NIXI node in Mumbai, where regional peering between the two operators could occur.

4.2.8   This process, though, does not address what would happen if the customer retrieving the web site was a Dialnet customer, rather than a Sify one. The Authority's Task Force had suggested that each of the NIXI nodes should be connected to each other so that the smaller ISP's like Dialnet could transit their traffic over NIXI backbone when trying to peer with an ISP in another region. This would apply for peering between two small ISP's in different regions as well as for a smaller ISP with a larger one, where the information being accessed was in another region (like the example above). Analysis by the operators in NIXI has indicated that this would not be the most efficient solution since NIXI is not intended to be and does not have expertise in owning and operating backbone infrastructure, and this would also allow scope for greater misuse of NIXI backbone. The solution, therefore, is that even though the four nodes will remain disconnected, the largest ISP's and backbone operators who have national infrastructure will serve as the connectors between the NIXI nodes for the regional players. Since this service is part of the core competency of those companies, it would result in the lowest cost structure and most efficient operations. The regional ISP's would take this service from one of the larger players through private peering arrangements, but the price would be determined by NIXI.

4.2.9   The cost of providing this service has been agreed to be cost-based on the cost of providing a 2 Mbps link over long distance. The rates will be on a per GB basis of data traveling in each direction, derived from peak traffic flow calculations of the amount of data that can be carried over that link. The approximate order of magnitude is going to be

Rs. 200 per GB. This price will also drop as the prevailing price for domestic leased lines drops in the market, and could over time become even more minimal.

4.2.10   To further address the issue of free-ride, the operators decided to implement a system of fair exchange at each regional node. This tracks how much traffic has been requested (X) and delivered (Y) from each ISP and to which ISP, similar to an inter-connect model, and calculates a periodic net balance. This net balance (X-Y) is settled between each of the ISP's, with NIXI as the facilitator. The price is determined based on a process that is similar to what was used above for national links, expect this time using a local 2 Mbps link as the base for the cost analysis. The order of magnitude for this settlement is Rs. 50 per GB, with the possibility of further decrease as bandwidth price in the market drops. This system compensates larger ISP's for the larger bandwidth they would need to establish to connect to NIXI for the large volumes of requests they have to respond to.

4.2.11   Other charges, such as joining fees, port charges and rack space will be kept at minimal levels to encourage ISP's to join, and not raise the cost of their operations.

4.2.12   Establishing more than just the two initial nodes in a timely manner is also important. This ensures that increasing amounts of the country's traffic is captured within the NIXI architecture quickly. The NIXI board has indicated this will continue at a quick pace. The operators have also indicated that equipment used in NIXI's operations will be upgraded to accommodate higher speeds and capacities as more operators join and increasing amounts of traffic is exchanged at the node. ISP's, though, should consider establishing links to NIXI with higher capacities to ensure that there is no bottleneck in that part of the network, and to send higher volumes of their exchangeable traffic to NIXI.

4.2.13   While NIXI has been proactive in negotiating low rates with certain bandwidth providers for leased lines to inter-connect with NIXI, there are still instances when it is prohibitively expensive for certain ISP's to connect to NIXI from their point of presence. To alleviate this hurdle, and to also provide a boost in initial subscription, the Government, via NIXI, should consider subsidizing 30 – 50% of the cost of leased lines for the first few years for Class B and C ISP's so that this link is not a significant part of their operating expenses. Furthermore, backbone services providers, including NLDO's,

BSO's and IP-II operators, should be mandated for the next two years to provide links to NIXI for ISP's if it is technically feasible at prices which are 10% lower than the discount levels which are officially submitted to the Authority.

4.2.14   Finally, during the consultation process, operators raised concerns about the present governance structure. Though the Government is funding the initiative in the initial stages, the industry, including incumbent operators like BSNL, are the ones who will be managing and operating NIXI in the long term. The Authority is of the view that the Board of Directors of NIXI should consist of 12 members, with the greatest weighting given to the largest operators in the country, including BSNL. These large operators should be assigned five seats, while smaller ISP's should have representation via two seats. Two seats should also be reserved for independent individuals who do not have managerial stake in ISP operators, while the remaining three seats should be reserved for Government representatives, one each from DIT, DOT and TRAI. This structure will ensure maximum momentum and that all applicable stakeholders, participants and the regulator have sufficient participation. The regulator's presence will also allow closer monitoring and speed in addressing inter-connect issues that may arise in the future.

4.2.15   Once the NIXI platform is established in this manner, operators have expressed that they would be more willing to join the exchange. Once ISP's realize the cost benefits, NIXI will see reinforcing growth from increasing network effects, and will be able to charge for these and other value added services to bring it revenues for sustaining its operations. This initiative then will have significant impact on allowing provision of internet and broadband services in India at better cost levels for operators, and thus better price levels for customers.

It is therefore recommended:

4.2.16   The current working group of NIXI's Board of Directors should complete the process for arriving at commercial agreements and processes and make their plans and price list for services publicly available within two months.

4.2.17   Providers of backbone services, including NLDO's, BSO's and IP-II operators, should be mandated for the next two years to provide links to NIXI for ISP's, if it is technically feasible.

4.2.18   The Authority is separately specifying a special tariff for such links, namely that these links are to be provided at prices which are 10% lower than the market prices charged by the above mentioned providers of backbone services.

It is further recommended:

4.2.19   The Government should consider for the first two years subsidizing the cost of leased lines from a Class B or C ISP's point of presence to a NIXI node for purposes of promoting inter-connection.   The order of magnitude of this support should be 30 – 50%.

4.2.20   The structure of the Board of Directors of NIXI should be altered to account for appropriate weight and participation from the applicable constituencies. This should include a total of 12 members, with the greatest weighting given to the largest ISP operators in the country.   These large operators should be assigned five seats amongst them, while smaller ISP's should have representation via two seats. Two seats should also be reserved for independent individuals who do not have managerial stake in ISP operators, while the remaining three seats should be reserved for Government representatives, one each from DIT, DOT and TRAI.

Chapter 5.   Fiscal Policies for Broadband Services Penetration

5.1   Evidence is clear on the direct impact of ICT on the Total Factor Productivity in many economies worldwide. The impact on India has been estimated by the CII and discussed in Appendix 2 – CII National Broadband Economy Committee Recommendations. In that background, and in the context of low usage of internet and broadband services in the country, it is necessary to explore various methods of creating incentives for the usage of these services. One of the standard methods under such circumstances is to look at providing incentives through fiscal polices. The ITU has reported that devices to access these services, e.g., personal computers, are often prohibitively expensive for consumers in developing countries.   Therefore, many developing countries fall into the vicious circle of high prices and low adoption rates. Various measures are required to be taken to boost broadband and internet usage in the country, thus enabling the country to reap the gains of ICT and its applications in the form of enhanced productivity and other welfare gains to the maximum extent within the minimum possible period.

5.2   The broad objectives of providing fiscal incentives, as described below for both direct taxes and indirect taxes, are threefold: to make the relevant equipments available at the most affordable prices possible to the greatest number of consumers in the country, to stimulate investment in the domestic manufacture of such equipment at affordable prices, and lastly, to provide an inbuilt mechanism to enable consumers to reap the full advantage of advancements in technology. The CII has demonstrated in its research that if the appropriate steps are not taken, an introductory broadband service offering of Rs. 800 would be more than doubled assuming that all costs related to taxes and duties are passed on to the customer.[30]

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[30] "India's Broadband Economy: Vision 2010; A Discussion Paper", Confederation of Indian Industry, Department of Information Technology & Department of Telecommunications, Prepared by IBM Business Consulting Services, December 2003

5.3 Incentives for PC and Access Device Penetration

5.3.1   As stated above, availability of low cost access devices is an important driver for internet and broadband penetration.

5.3.2   Currently computers and broadband equipment get 100% depreciation in three years, though the advancement of technology often makes such equipment obsolete much earlier than that. In order to stimulate investment in the equipment sector and also to enable consumers to keep abreast of technological advancements, accelerated depreciation allowance should be provided for these equipments i.e. 100% depreciation in the first year itself. Such accelerated depreciation allowances provided by countries like Singapore did result in higher penetration of personal computers in their society.

5.3.3   Tax holidays for organizations / individuals who donate their PC's and other related equipments to designated institutions like schools run by government / local bodies and other charitable organizations / community centers should also be implemented. This would not only create incentives for recycling PC's, but would also motivate such donors to replace their systems with the latest models, increasing their own productivity through having more advanced functionalities. The value of the PC for the amount of the tax holiday can be established by the Government in a schedule that covers basic features and age.

5.3.4   To further support the objective of making lower cost access devices available in India, the levy of anti-dumping duty of US$200 on the importation of used PC's into India should be removed. Since this can substantially bring down the cost of acquiring a PC, it is important that the contribution of this to our social objectives be specifically taken into account when deciding whether to levy contingent measures such as anti-dumping duties.

5.3.5   Other countries, like Korea, Malaysia and Thailand have taken significant steps with government funding this area for providing low cost and free PC's to low income families and for all schools. The Korean and Malaysian government provided heavy subsidization and low interest rate loans to help families with children obtain and PC and further their ICT education. Malaysia also allowed these families to draw funds against

their retirement accounts to be applied towards such a purchase. In Thailand, the government procured a large volume of PC's, 120,000 desktops and 20,000 laptops, and was able to bring the cost down to US$250 for a desktop with Linux and US$290 with Microsoft Windows XP Home and Office XP.[31] While these effort produced excellent results in those countries, the Authority is of the view that the below recommendations could have impact of similar magnitude in India considering the current environment and landscape, and as progress is tracked in the future, efforts similar to those cited above may need to be taken into consideration. Furthermore, the below recommendations do not call for current spending by the Government, whereas initiatives taken by other countries have been allocated large amounts of funding.

It is therefore recommended:

5.3.6   Consideration should be given to allowing 100% depreciation in first year for PC's and broadband Customer Premise Equipment (CPE) including modems and routers.

5.3.7   Consideration should also be given for tax benefits to organizations on the value of PC's, as defined by the Government through a value schedule, that they donate to schools run by the government / local bodies, and charitable organizations.

5.3.8   Finally, consideration should also be given to removing the anti-dumping duty for recycled PC's imported into India.

5.4   Tax Policies on Imported Finished Goods and Inputs

5.4.1   Currently, there is also a need for reduction from the current level of customs duties levied on the import of inputs (parts, components and spares) required for manufacture and maintenance of broadband equipment, as well as on finished products, such as Customer Premises Equipment, that are used for broadband and internet. The specific items are given in Appendix 4 – Current Levels of Duties. The example of

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[31] "Thai Budget PC Project: Bridging The Digital Divide Case Study" H.E. Dr. Surapong Suebwonglee, Minister of Information and Communication Technology Thailand, ITU Global Symposium for Regulators, December 2003

mobile phones should be considered in this regard, as the jump in sales demonstrated how beneficial the cuts in duties were to customers.

5.4.2   Furthermore, often the duties imposed on inputs are less favorable than those on finished goods. To promote indigenous manufacture of these devices, the central excise duty levied on these items should be reduced to make the levels no less favorable than for imported finished products.

It is therefore recommended:

5.4.3   Duties levied on inputs (parts, components and spares) and finished products used in providing broadband and internet services should be reduced to levels equivalent to that for mobile phones.

5.4.4   Additionally, the central excise duty levied on these items should be reduced to the extent the customs duties are proposed to be reduced on a pro-rata basis, and in line with duties on imported finished goods.

5.5   Tax Policies to Promote Broadband Penetration

5.5.1   Hosting of websites within the country is one of the key drivers for the promotion of internet growth. It is, therefore, important to encourage both domestic and foreign players to host their websites within the country. This will address one of the key dimensions of accelerating broadband and internet penetration, i.e., local content availability. An additional advantage of this would be a reduction in the country's reliance on expensive international bandwidth and in the cost of operation of ISP's because increasing proportions of internet traffic would remain within India.

It is therefore recommended:

5.5.2   Profits that accrue to such web hosting enterprises should be partially exempted from the income tax by at least 50% for the next 5 years.

5.5.3   Additionally, a combination of central and state-level service and sales taxes has added to the cost of purchasing and using broadband services. For example, certain State Governments are imposing entertainment tax on broadband subscriptions. The rationale for this is not completely clear and the tax significantly raises the cost of subscribing to broadband services. Reducing or eliminating these levies will cause immediate cost reductions for consumers and provide a significant boost in growing broadband and internet penetration.   Also, providing personal reimbursement for employees of corporations and professional, much as reimbursement for automobiles is provided, would provide further boost to achieving broadband penetration goals.

5.5.4   Overall, since internet and broadband penetration in the country are low, at 0.4% and 0.02% respectively, the loss of revenue to the Central and State Governments will be marginal, but these efforts will boost growth by reducing the cost to the consumer. As was witnessed in mobile telephony, this growth has the potential to be large and in the future can be a significant source of revenue for the Government.

It is therefore recommended:

5.5.5   ISP's should be exempted from the payment of service tax, which is 8% of the value of the service provided, for the next 5 years. This exemption will reduce immediately the cost of purchasing such services by 8% to the customer.

5.5.6   The service tax levied on the services that are used by ISP's in the delivery of their service to internet and broadband customers should also be exempted.

5.5.7   The Government of India should also recommend to all State Governments to waive sales tax on goods and services that are transacted through electronic mode (e-commerce) for the next 5 years up to limits to be prescribed by the Government. This recommendation should be then followed with legislation to ensure execution by the State Governments.

5.5.8   A similar recommendation or legislation should also go from the Government of India to the State Governments to waive Entertainment Tax, currently approximately 30% in certain states, levied on broadband subscriptions

and entertainment services, if they are provided through a broadband or internet platform. This recommendation should be then followed with legislation to ensure execution by the State Governments.

5.5.9 All corporations, whether public or private, should be allowed to give a Rs. 6,000 per annum allowance to employees for broadband services access at home. This allowance should be removed from taxable income for the corporation. The same facility should be extended to self-employed professionals so that they may also reap the benefits of broadband services.

Chapter 6. Content and Applications

6.1   Content and applications constitute the third pillar for the overall growth of internet and broadband, with the first two pillars being infrastructure for access and access device. In this area, while private enterprise has and will continue to play a major role, the initial impetus and momentum can best be provided by the Government. This can be done by ushering in an environment where usage of ICT technologies in the day-to-day interaction of citizens with the Government becomes a basic requirement. There are several international and national initiatives to guide us in formulating our further course of action. These are discussed in the following paragraphs.

6.2   In India, The National Task Force on Information Technology and Software Development was created by the Prime Minister, and they submitted 108 recommendations in the "Information Technology Action Plan: Part 1" in July 1998. A review was conducted by the DIT, and an update submitted in October 2000 on these recommendations. The goal was to, "prepare a blue print for making the adoption of Information Technology into a national movement, with a wide network of empowered task forces at all governmental and non-governmental levels."[32]

6.3   In e-Korea Vision 2006, which is Korea's master plan that was released in 2002 for the Government's role in promoting the spread of ICT infrastructure and applications, the Prime Minister, Han-Dong Lee, stated, "In the era of global competition, the role of *informatization* will only become greater in determining the efficiency and transparency of the overall society for the competitiveness of that nation."[33] The Prime Minister is referring to how crucial he feels it is to bring their society completely online and connected via information that is available and accessible to all citizens easily via the internet.

6.4   The goals of the e-Korea initiative were clearly outlined as:

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[32] "Action Taken Report (ATR) on the 108Recommendations of the National Task Force of Information Technology and Software Development", Department of Information Technology (Industry Promotion Wing), October 7, 2000
[33] "e-Korea Vision 2006, The Third Master Plan for Informatization Promotion (2002-2006)", Ministry of Information and Communication, Republic of Korea, April 2002

- Maximizing the ability of all citizens to utilize ICT to actively participate in the information society

- Strengthening global competitiveness of the economy by promoting efforts across industries

- Realizing a smart government structure with high transparency and productivity through informatization efforts

- Facilitating continued economic growth by promoting the IT industry and advancing information infrastructure

- Becoming a leader in the global information society by taking a major role in international cooperation

6.5   Their efforts in the past years have yielded significant benefits in both the government and private sectors. These advancements have included:

- A shortened time for processing exports from more than a day to less than 2 minutes, and for imports from more than 2 days to less than 2 and half hours, and also reducing logistic costs by at least 500 billion won per year

- Electronic employment information systems have helped 1.9 million people obtain jobs between 1999 and 2001 by providing comprehensive employment information regarding job openings, vocational training programs, etc.

- Government procurement through online services has enhanced the productivity and transparency of these services by reducing the time to process documents from more than 2 days to less than 30 minutes

- Financial institutions have utilized ICT to provide 24 hour electronic banking services, achieving over 11.3 million customers subscribed to Internet-based banking services. Furthermore, 66.6% of the total monetary value of stock trades were handled on broadband as of December 2001

- As of December 2001, approximately 40,400 health care facilities had introduced EDI to health insurance to improve efficiency in health insurance administrative processes

- Korea has become the only nation in the world to have wired all elementary, middle and high schools to high-speed internet services and also provide e-literacy programs for the general public

6.6   In India, the same effects can be accomplished if the Government takes an aggressive role in pursuing the goals that have already been set out previously by the Task Force in addition to new ones based on what we can learn from what other countries have successfully been able to implement. Narrowband internet and low speed data channels have been used in the country in various pilot projects and in some cases, large scale endeavors, too. This has successfully demonstrated the importance of an electronic means of information transmission in the following areas: e-governance, e-business, e-education, and e-health including tele-medicine.

6.7   Examples of these projects include Bhoomi, eSeva, Gramdoot, Gyandoot, and the Railway Reservation System. Bhoomi was undertaken by the Karnataka state government to computerize land records and electronically track change in ownership details. While the implementation was by the Revenue Department of Karnataka, the deployment in the field was done at the district level. eSeva is an initiative by the state government of Andhra Pradesh for providing citizens with services for payment of utilities bills, birth certificates, various licenses, reservation of bus tickets, and provision of government orders and policies online, among other things. Gramdoot, an initiative by the Rajastan state government, is similar to eSeva in that it has a wide range of services including e-mail, e-commerce, matrimonial services, market rates, expert advice tele-medicine, web conferencing and entertainment, in addition to e-governance services that include domicile certifications, caste certificates, ration cards, revenue records and other services. Gyandoot, in the Dhar district of Madhya Pradesh, creates rural cyber cafes and offers over thirty five different e-governance, e-commerce and e-learning services. The Railway Reservation System, though, is different from the other projects in that it was initially undertaken to computerize and make more efficient the back office processes of the ticketing department. This service was then extended to passengers through the internet, and soon will also be available on mobile phones.

6.8   The pilot programs and trials for the above applications and others using narrowband internet and low bandwidth have generated substantial interest in using electronic media as a key ingredient to increasing efficiency in productivity and utilization of resources. These projects have also demonstrated that in terms of skill enhancement and social benefit, such electronic media produces the quickest results.

6.9   There are several impediments to the growth of these applications throughout India, not the least of them being the cost of infrastructure, including the customer premise equipment. Fortunately, there have been extensive technological developments taking place, which are decreasing the cost of customer premise equipment and provisioning of increased amounts of bandwidth. The spread of applications and technology may have also been slow because of a lack of well-developed business models and the possible lack of a "killer application".

6.10   The availability of broader bandwidth substantially enhances the value of each of these applications in terms of much faster speeds, for example interactive course material in e-education or video conferencing in e-governance, higher quality for better image transfer in e-health applications, greater security through higher level encryption for reliable business transactions, etc. In addition, a major advantage of broadband infrastructure is the possibility of high quality, high demand content, e.g., entertainment, being carried to the customer in exchange for payment, thereby substantially improving the business case for the deployment of such networks. It is anticipated that entirely new employment opportunities will develop around the business of content development, content aggregation, gaming, etc. through broadband.

6.11   An extensive study of content and applications, and also the use of broadband in public services, has also been reported in the CII study. This study not only states in detail the advantages of the deployment of broadband, but also that a large number of initiatives at the industry and government levels have to be taken. The Government needs to have a focused program that concentrates on promoting e-governance, e-health, and e-education. A proactive role played in these areas will provide a boost to spur further development, and the Authority is of the view that once the initial steps are taken to develop infrastructure and applications, entrepreneurs will quickly participate in further developing content and applications. They will drive automation of industry, improving capture and flow of information, and design applications that both businesses and consumers will find valuable, thereby further creating incentives for more users to come on the internet.

6.12   The actions taken by other countries in these efforts show us examples of steps that could also be effective in India. In the past, the Korean government took the

initiative of giving every one of their employees their own e-mail address as a way to familiarize them with using ICT services. They also set a goal of moving everything they do online. This made the government not only a key enabler of ICT services roll-out, but also initially one of the best clients of ICT services and equipment and gave domestic enterprises a boost. In Malaysia, the government ensured that even village authorities were provided with a PC and internet connectivity in their administrative offices for interacting efficiently with other government bodies.

6.13   Particular stress was also placed on education. In Korea, each teacher has access to a PC with internet access, and is required to leverage ICT as part of the coursework. The usage of such elements in coursework increases as students rise through classes. As of 2002, over 55% of all educational documents were processed electronically. In Malaysia, a third of the education ministry's budget is devoted to connecting rural schools, and ensuring that each school has at minimum one computer lab with internet connectivity. Like in Korea, teachers in Malaysia are also required to be familiar with ICT and incorporate it into their teaching. It would be similarly applicable in India to pursue such initiatives where education curricula are required to incorporate ICT services. Elements, for example information related to the CBSE board exams, should be mandated to be available online. The Government could also begin offering ICT orientation sessions so that the public may begin to familiarize itself with not only how to use PC's and the internet, but also what the advantages are of leveraging such services.

6.14   Some of the policy initiatives that are being undertaken by Korea going forward as part of e-Korea Vision 2006 include:

- Constructing an online portal that will offer a one-stop window covering all government institutions with civil service channels that will be open at any time, anywhere through electronic channels, with delivery of statements and bills through online and traditional paper format
- Creating online public policy discussion forums
- Enhancing efficiency in public finance through upgrading information systems and linking all such systems, including budgets, liquidations, auditing, and accounting

- Creating an integrated national tax service system for online payments and notifications

- Providing an online portal of customs services including an internet-based customs clearance system

- Using the online channel to disseminate information concerning government procurements to promote e-commerce and constructing an online bidding system

- Digitizing the justice and law enforcement system for increased public safety and linkage between various organizations that are involved in the process country-wide

- Increasing internet access for less privileged individuals by opening approximately 10,000 schools across the nation as IT centers to the community during after-school hours

- Supporting the supply of personal computers and social welfare facilities to less privileged individuals, including the development of telecommunications services and terminals especially for the handicapped

- Enhancing education through establishing online learning systems to be accessible anytime, anywhere, and by anyone, using multimedia, and developing digital content especially for educational purposes to improve the online learning environment

- Introducing an evaluation system to measure the ability of information and communication technologies to enhance the level of effectiveness of IT education

- Expanding specialized online education programs to the elderly and the handicapped

- Taking measures to reduce the level of unemployment among youths through job training and job transition programs in the IT field

6.15   While commendable efforts have been described in the Information Technology Action Plan, the execution seems to have been less than sufficient. For example, recommendation No. 87 calls for each department and agency in the Government to have a five year IT plan, No. 59 states that computers and internet access should be made accessible to schools, polytechnics, colleges and public hospitals by 2003, and No. 60 calls for all institutes of higher learning and research and development organizations to be networked for supplementary distance education by 2000. With tremendous foresight,

there are a number of other goals of this sort that had been created by the National Task Force. Though in some instances significant progress has been made, on most of the initiatives that deal with e-governance, e-education or deployment of network connectivity not enough progress has occurred. While the Action Taken Report is from October 2000, it is felt that significant advancements in this arena have not been made since then. Various new areas of focus could include networking and connecting to the internet the many unconnected PC's which are currently deployed in Government offices. The Government should also shift transactions to electronic format, such as filing of tax returns and payments of those returns through direct bank transfers, payment of utilities bills, and conducting all transactions with the Government above certain monetary value via electronic transfer. Citizens could be given incentives in the form of faster processing times, discounts, or other advantages to accelerate this type of shift once the Government establishes the infrastructure.

Taking into account past experiences in the country and internationally by other governments, it is therefore recommended:

6.16   A position in the Department of IT should be created for purposes of formulating and monitoring a detailed time bound action plan and for aggressively driving efforts related to this goal. The title of this position would be Project Director (e-Governance) and should be at the level of Secretary to the Government of India. This individual would be part of a committee of Ministers who would facilitate in setting priorities and cross-departmental coordination since the efforts would span the breadth of the Government. This Ministerial group should include the departments of Communications and IT, Human Resources Development, Health, Law, Finance, and Commerce. The Group of Ministers should include a few eminent industry leaders to help in obtaining non-governmental inputs.   The responsibility of this Ministerial group would be to create a new vision for bringing India online through e-services and the Project Director shall ensure cross-departmental coordination of existing efforts that are being executed at the State and Central level as well as new initiatives in four areas: e-governance in Central Government processes and system, e-education, e-health, and e-governance by State Governments with possible funding from the Central Government. Having created

that vision, s/he would be the nodal point of execution and coordination to make sure that the initiatives are implemented in a timely fashion, and goals are met.

6.17   Creating this environment not only enhances the productivity of the public sector, but also results in prompt and accurate civil services. Furthermore, this would allow for greater transparency in processes within the Government. Without such efforts, India will not be able to realize its full potential and various benefits that other countries have been able to.

Chapter 7.   Commercial Governance

7.1   Quality of Service Issues

7.1.1   Quality of Service (QoS) for internet has been lightly regulated, though some broad parameters for dial-up and leased line internet access have been specified by TRAI. An effective monitoring and enforcement mechanism for the same is not in place at present.

7.1.2   QoS will be extremely significant in the context of broadband, as there is opportunity for operators to misrepresent their services to consumers. Considering that broadband services will typically require up-front installation costs, the opportunity for users to test or migrate to other providers is limited because of the potentially high cost associated with it. In the interest of consumers, especially in the early stages of broadband deployment in the country, the Authority will play a proactive role in specifying QoS parameters that all broadband service providers will have to abide by. This may include minimum qualifications of the service to allow operators to even call the service broadband.

7.1.3   Some of the stakeholders have suggested that monitoring of these parameters by NGO's, consumer organizations, or other independent agencies can make the system more effective. The Authority will address these issues in the near future with the goal of arriving at the parameters and associated processes.

7.2   Tariff Policies

7.2.1   Another major tool available to drive penetration of internet and broadband services is the structure of the tariffs and plans that are offered by service providers. It has been heavily stressed throughout this set of recommendations that the most important objective of these initiatives is that the cost at which internet and broadband service is provided to consumers needs to be brought in line with and even below international norms.

7.2.2   The Authority has normally emphasized the regulatory objective of non-discrimination in the context of tariffs, but has relaxed this objective for tariffs of internet access services in order to spur growth. The Authority is of the view that innovative tariff offers, including bundled tariffs for internet and broadband can give a significant boost to demand for these services. These offers could include flat rate for access plans, and bundling broadband services with video and/or voice telephony services for operators with the appropriate licenses. In this background, the Authority would like to clarify that it would allow bundling of services and products in the provision of internet and broadband services, in line with the examples mentioned above.

Chapter 8.   Future Issues and Link to Unified Licensing

8.1   There are certain topics which were addressed during the consultation process that stakeholders feel will have significant impact on development of internet and broadband in the country. Considering the other initiatives of the Authority and the current state of the internet industry in the country, the Authority is of the view that the topics below should be handled in the future, independent from the current recommendations.

8.2   Internet Telephony and VoIP

8.2.1   The primary outstanding issue in regards to internet telephony is whether telephone voice calls that are data packets and travel across the internet will be allowed to connect with traditional PSTN and cellular networks for either origination or termination of those calls. Further, the issue of access to the national numbering plan also needs to be considered.

8.2.2   While unrestricted internet telephony may be allowed in the future, the consideration of this will be more applicable under the Unified Licensing exercise. That process will examine how to establish the norms for inter-connection, licensing rules and fees, ADC and USO payments, and any other regulations that will have to be imposed. Further, the Unified Licensing process will also consider how to maintain a level playing field with existing operators.

8.3   Rural Development and USO Policy

8.3.1   There is a provision in the current USO guidelines that basic data transmission facilities, at least in all those villages where regular post offices are located, be provided by the year 2004. It has been envisaged in the guidelines that approximately 35,000 VPT's should be upgraded to function as Public Tele Info Centers (PTIC's) by the end of 2004.

8.3.2   In addition there is also a provision to install High-Speed PTIC's (HPTIC's) by upgrading the existing VPT's to provide wideband applications like e-education and tele-medicine based on 128 Kbps throughput. In the first phase by end 2004, approximately two HPTIC's are planned to be set up in each SDCA, totaling approximately 5,000 HPTIC's for the country.

8.3.3   Several stakeholders are of the view that there should be revision in the current USO policies to accelerate broadband penetration. Some stakeholders raised the issue that current USO policies omit others operators like ISP's & IP-II players from direct participation in USO funded projects. This situation does not lead to the most effective market scenario for execution of these initiatives as there is no competition for providing these services.   Furthermore, those companies interested in providing internet connectivity to rural and remote villages where a self-sustaining business case is not immediate would like to be able to bid for USO funds to support the initiative.

8.3.4   Stakeholders have also mentioned that a requirement for operational uptime should be a pre-requisite for receiving reimbursement from the USO fund for operators. They claim that this should be applied to all projects.

8.3.5   Finally, stakeholders have raised the issue of special treatment of rural operators in terms of rules regarding internet telephony, inter-connect to PSTN charges, and license fees. While ISP's today are not allowed to provide internet telephony or inter-connect to the PSTN, they claim that allowing this facility for rural areas will significantly enhance both broadband and telephone penetration goals over a shared infrastructure. Further, reduction of inter-connection fees, and exemption from ADC and/or USO would help achieve these objectives faster.

8.3.6   This set of issues will also be addressed during the process for establishing the Unified Licensing regime. A scenario may be considered that accounts for niche operators having special operating privileges in rural and remote areas.

8.4 Digital Rights Management and Copyright Related Laws

8.4.1   As the spread of internet and broadband is achieved, the issues of digital rights management (DRM) and digital copyright will quickly arise. Content providers will be unwilling to make their products and services available via the internet if a strong system is not in place to protect them. While there are still standards emerging for DRM in other countries, most of these countries have put the legal structures in place.

8.4.2   This set of issues may be taken up by the appropriate Ministries and examined further. The CII study has also discussed these in some detail, recommending the nature of things which need to be addressed.

8.5 Migration to IPv6

8.5.1   Many stakeholders have expressed that as internet and broadband penetration becomes pervasive in India, the number of IP addresses available will quickly diminish. International studies have been conducted, and much research has been done to prepare technologies for the possible eventual migration to the next generation of IP addressing, IPv6.

8.5.2   In the future, the Authority will consider this issue, and consider plans to foster the potential migration of the industry.

8.6 Supporting Alternative Platforms

8.6.1   Similar to what many other countries like China and Thailand have done, the Government may need to consider aggressively supporting usage of open source operating system platforms, as well as the development of applications for these environments. Such efforts have helped bring down the overall costs of access devices significantly, reduce the cost of the leading software platform due to the growth of competition, as well as alleviate the reliance on software from a single company. In India, since access device penetration and therefore number of users is relatively low, there is also lower cost of retraining and migrating users to an open source platform who are used to a proprietary one. Therefore, the opportunity exists now for new users to be funneled

towards these alternative solutions, thereby boosting access device and broadband penetration.

Appendix 1.   Case Studies

Republic of Korea (South)[34]

Korea is the poster child for successful broadband roll-out and ubiquitous availability. For the vast majority of Koreans, using the internet and availing of the facilities that broadband has to offer has become part of their way of life. Additionally, though the internet for consumers in most places around the world has not made spectacular amounts of money, Korea has found ways to generate significant revenues. In 2002, US$148 billion, nearly 30% of GDP, was transacted on the internet.[35]

This growth has been a recent and accelerated phenomenon. In 1995, they still had less than one internet user per 100 inhabitants, but surpassed the developed nation average of approximately 25 by 1999. By the end of 2002 they became the world's fifth largest internet market, with the third highest penetration (highest in Asia).

Korea is actually not the most suited of its peer group, Hong Kong, Singapore and Taiwan, to have reached this high level of success in ICT. They actually have the lowest per capita GDP and overall population density of the four. Additionally, their language is distinct, and even has its own characters. But, Korea does have the advantage of the highest literacy rate (98%) and school enrollment rate. The biggest factor in its success, though, was that the government played a big role in coordinating the right steps from both public and private sector. The approach they took can be described in three parts: creating the right environment, through pre-open market policies in telecommunications; intervention at the non-market end of supply, funding of internet backbone roll-out within cities and to more remote areas; and finally intervention at the non-market end of demand, by providing IT training and moving the government to absorb ICT as part of their operations.

Infrastructure

The beginning of this growth was really spurred by the permission of local phone competition. In April 1999, Hanaro entered the market, and started offering DSL services

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[34] Broadband Korea: Internet Case Study, ITU, March 2003; TRAI analysis
[35] Korea Network Information Center

to attract customers away from the incumbent, Korea Telecom (KT). Since the population lives mostly in apartments within a densely packed city, especially compared to the spread of population in India, building a competitive local loop can be economically justified. This entry forced KT to abandon its investments in ISDN and move into the superior DSL technology before losing its customers. KT benefited significantly from this move as it leveraged its installed copper base to realize average revenue per user (ARPU) seven times higher than it had otherwise from basic telephony service. It also attained pay back for its investments in only a little over a year.

Additionally, the Ministry of Information and Communication (MIC) has a very straightforward and simple licensing program. There are three license types: Network Service Provider (facilities builder and operators), Specific Service Provider (resellers of others' facilities) and Value-Added Service Provider (such as ISP's). It also has a policy of keeping all revenues originating from telecommunications within the sector to fund government projects and incentive plans.

As the market began to grow, the government made it a priority to develop the ICT sector and bring Korea into a position of leadership. To help that process, it dedicated US$2.4 billion to create a national backbone over fiber. This backbone was used to connect ministries, agencies, public institutions and schools. Furthermore, emphasis was made on developing a domestic exchange. When the first one that was built became insufficient a significant overhaul was done and a new one established. Most ISP's connect to each other through this facility rather than attempting private arrangements. The government also supported the private sector through establishing a relationship of giving advice on planning and growth. By offering low interest rate loans to facilities based service providers, and using providing further incentive for them to invest in less densely populated areas, the government was able to create economic payback that far outstripped the cost.

ISP's were also given the opportunity to offer whichever converged services they desired. This meant that they had higher incentives to upgrade and build infrastructure either on their own or in partnership with FSP's. The ability to provide voice over IP, television and internet services provided for multiple revenue streams to subsidize the cost of their overall operations and reach economies of scale. The VoIP market in Korea is actually

growing much faster than the PSTN market, and is expected to completely replace normal telephony in the near future. This has of course provided tremendous benefits for consumers, especially in the national and international long distance markets. Finally, ISP's were also provided with a very liberal international gateway policy. Because of this, costs have been kept very competitive, and Korea has over 5.2 Gbps capacity to other countries.

To attract consumers, ISP's have favored flat rate pricing based on bandwidth required. The user has the ability to select different levels and combinations of downstream and upstream bandwidth and is charged based on that, but in the vast majority of cases users are not capped to a specific amount of data transferable in a month. The tariff in Korea today is among the lowest in the world at $30 per month for 10 Mbps downstream.

Overall, the market today has a variety of options for broadband access. A large portion of households are also passed by cable, giving them the option of access via cable. Additionally, companies providing LAN, wireless in local loop and satellite-based access also exist. The mobile telephony market also had significant impact on overall internet usage and broadband penetration. With Korea being a primarily CDMA market, data connectivity at high speeds, and therefore applications and gaming became increasingly popular. More recently, WiFi hot spots have sprung up almost ubiquitously, too. This inter-modal competition also keeps the pricing and customer service levels of the service providers in check.

Access Device and Content

Local manufacturing has played a large part in controlling costs of PC's in Korea. The large technology conglomerates almost all play in this space. Additionally, many local manufacturers also play in the actual infrastructure part of market, providing customer premise and service provider equipment.

As mentioned above, a large part of the content provided by ISP's is through their ability to provide converged services. The reduced cost of telephony available via VoIP and the television access demonstrated significant value beyond just internet access to consumers. Further, though, gaming and multi-media messaging has also become part of the way of life, especially for youngsters. Especially good news for ISP's is that users of these

services are willing to pay more for them. In terms of local content development, Korea has exploded. The traffic and usage patterns of Koreans make them the largest users of indigenous content. The top 10 web sites are all local ones in Korean, and the number of .KR sites ranks the nation fifth in the world.

The government also played a significant role in this realm. They provided training on PC and internet usage for low income and disabled households with children. They launched programs to also provide these families with heavily subsidized and sometimes free PC's. Demand for usage was driven within the government, too. Each employee was given her own e-mail address and was trained on how to leverage ICT as part of their daily tasks. Over 55% of all educational documents and government filings are electronic at this point. Teachers in schools have access to their own PC's with internet connections, and are required to leverage ICT as an integral part of their curriculum. This increases with higher levels of education. The central government has made it part of the core goals of all other governmental organizations to operate in this frame of thought where ICT becomes a key enabler of their activities. In this end, the government also remains one of the largest and best clients for the ICT sector.

Malaysia[36]

Malaysia has fared very well in driving internet penetration across the country, even in its remotest of areas. Though broadband penetration has not yet reached significant levels, the number of users of the internet is impressive.

The primary driver behind overall telecommunications growth was that Malaysia opened its market much earlier than most other countries. The Communications and Multimedia Act of 1998 is the basis off which change was brought about in the industry. The main thrust of the act is to provide an environment of converged services. There are two bodies which control (Ministry of Energy, Communications and Multimedia) and regulate (Malaysian Communications and Multimedia Commission) all the services, and instead of the previous system of 31 service-specific licensees, there are four generic one. The four licenses are not too different from what was discussed earlier with Korea: network

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[36] Multimedia Malaysia: Internet Case Study, ITU March 2002; TRAI analysis

facilities provider, the owner and operator of infrastructure; network services provider, the supplier of basic connectivity and bandwidth to support application services; application services provider, the provider of specific functions like voice, data, e-commerce; and finally the content application services, a special subset of ASP which includes television and radio broadcast and internet content services.

The structure is completely technology independent and separates the actual activity being performed by the operator. So once a company providing voice services over their copper line wants to begin offering TV or data services, they can do so without the need for a new license.

Infrastructure

Since competition was allowed in both cellular and fixed markets in the mid-1990s, multiple operators are present with varying levels of infrastructure. Though the incumbent, Telekom Malaysia Berhad (TMB), maintains control over most of the backbone as well as lines to individual homes, other players have used highway, railroad, satellite and other wireless infrastructure to develop their own domestic connectivity.

The primary growth driver for internet has been reliable and inexpensive dial-up access. The government has heavily regulated telephone rental rates, providing residences in rural areas (based on number of lines in a switch) favorable rates – US$3.42 per month vs. US$9.21 for businesses in the cities on the Peninsula. Pricing of telephone calls is similar to the Indian market where both long distance and local calls are billed on usage basis. The long distance billing uses four charging bands based on distance. Though there are five major players, all tend to have similar rates, though some differences can arise in packages. But, calls to ISP are heavily controlled. Malaysia has the second lowest dial-up rate in Southeast Asia of 0.7 US cents per minute, as compared to 1.1 US cents per minute in India. This includes both the dial-up phone tariff and the cost of the internet access.

Another factor driving costs down for consumers is that ISP's are allowed to establish international gateways as long as they have a network facilities license. Since this market is left open, each of the players has significant bandwidth to access data abroad, with the two leading players, TMB and Jaring having a total of over 500 Mbps.

The regulation to allow VoIP without restriction has brought increasing competition into the market place for both telephony and internet. This, like in Korea, has served to attract users with another service that they find useful, and helps the ISP's in providing an additional source of revenue to help justify infrastructure spending.

Broadband access has been delayed in coming for a few reasons. Cable TV access is not widespread as most households prefer to stay with channels available via terrestrial broadcast. Those who do pay for premium television service tend to get it from satellite broadcasts. Additionally, the government has not forced TMB to unbundled the local loop, which TMB itself has obviously been trying to avoid.

Access Device and Content

As part of the government's overall objectives for ICT growth it has stated that universal access includes access to data, as well as a telephone line. It has defined data access as a minimum speed of 128 kbps (ISDN speed), and at minimum collective access on demand. Any community in Malaysia asking for such access should be able to have granted to them a telephone line with this speed of access in a reasonable amount of time. And the government has not stopped there in just defining infrastructure as access, they have also included "Financial means to afford and use ICT products and services; and basic skills or capabilities to use and the actual usage of ICT products and services."[37] It has allocated 5% of its total budget towards ICT spend over five years.

The ramifications of this declaration are that the government has launched numerous programs to address the various problems implicit in this statement. Village authorities were provided with a PC and internet connectivity in their administrative office and PC's with free internet access were setup in post offices, with special government portals created to provide local information and government services. Since the purchase price of a computer with internet access can be 90 percent of a rural household's disposable income, the government launched many efforts to reduce costs. By allowing families with children over 10 years old to withdraw money from their retirement funds to

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[37] National IT Council, Access and Equity, INFOSOC Malaysia 2000

contribute to PC purchases, and providing subsidized PC's at special events, the government has worked to overcome the hurdle that expensive access devices cause.

The Malaysian government has also taken it upon themselves to bring the government completely online and have ICT be an integral part of their system. They commenced the building of a private broadband government network, extended by a virtual private network (VPN). They also launched the Multimedia Super Corridor (MSC) as a nurturing ground for local entrepreneurship and industry, as well as attracting foreign organizations to establish offices there. The benefits of the MSC on the overall economy have already been tremendous, and what sets this apart from efforts of other countries is the scale and level of planning with which this was executed through infrastructure build-out and incentives.

Efforts were also taken to ensure that each school had at minimum one computer lab with internet connectivity for student use. The ministry of education actually reserves a third of its budget towards connecting rural schools. Teachers are required to take training in ICT use that as part of their curriculum. Distance learning has also become a hot topic in Malaysia with only 168 student in 1998, scheduled to reach 54,000 in 2005.

ITC e-Choupal[38]

ITC's International Business Division, one of India's largest exporters of agricultural commodities, conceived e-Choupal as a means to establish a more efficient agricultural supply chain aimed at delivering sustainable value to its customers around the world. The model was specifically designed to tackle the challenges posed by fragmented farms, weak infrastructure and the involvement of numerous intermediaries, among others, as seen in this industry in India.

e-Choupal releases the potential of Indian farmers who often face the vicious cycle of low risk taking ability leading to low investment, which leads to low productivity and then weak market orientation. This situation caused low value addition and therefore low margins, which then led back to low risk taking ability. This has made the domestic

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[38] ITC e-Choupal, ITC Limited, www.itcportal.com

agribusiness sector inefficient, despite rich and abundant natural resources. e-Choupal leverages IT to virtually cluster all the value chain participants, delivering the same benefits as vertical integration does in other markets. While intermediaries provide transaction supporting services (aggregation, logistics, counter-party risk and bridge financing), e-Choupal has removed them for the flow of information and market signals, providing that directly to farmers.

Village internet kiosks are managed by farmers themselves and enable direct access to information in their local language on the weather and market prices, disseminate knowledge on scientific farm practices and risk management, and also facilitate the sale of farm inputs and the purchase of farm produce from the farmers' doorsteps. This brings information-based decision making to each farmer. Real-time information and customized knowledge provided by e-Choupal enhances the ability of farmers to take decisions and align their farm output with market demand while securing quality and productivity. The aggregation of the demand for farm inputs from individual farmers gives them access to high quality inputs from established manufacturers at fair prices. As a direct marketing channel, virtually linked to the "mandi" system for price discovery, e-Choupal eliminates wasteful intermediation and multiple handling. Overall, this process greatly reduces transaction costs. While the farmers benefit through enhanced farm productivity and higher revenues, ITC benefits from the lower net cost of procurement, even despite offering better prices to the farmer, by eliminating unproductive costs in the supply chain. Even other corporations have expressed their interest in leveraging ITC's channel directly to farmers to reap the same benefits.

Launched in June 2000, e-Choupal reaches more than 18,000 villages through 3,000 kiosks across five states, adding an average of 6 new e-Choupals per day. The problems encountered while setting up and managing these kiosks are due primarily to lack of infrastructure, including reliable power supply, and telecom connectivity and bandwidth. Additionally, the challenge of imparting skills to first-time internet users in remote and inaccessible areas of India presents another challenge. But, the success has encouraged ITC to target reaching 100,000 villages across 15 states by 2010.

n-Logue Communications[39]

n-Logue has demonstrated very effectively that connecting rural India and using indigenous technologies to control costs can be done profitably and provides tremendous benefits. They have adopted the local service provider (LSP) model and addressed all three factors of the internet and broadband growth mode: infrastructure for access, access device, and content.

The LSP model has many benefits of local marketing and management including containing costs. It also provides real incentive for each operator to drive her own business to be as large as it can be since the structure provides her with personal benefits. n-Logue works in coordination with a middle agency that assists in the process of identifying potential entrepreneurs in villages across primarily southern India. These entrepreneurs are asked to invest minimal amounts of money, but are given rigorous training on how to use a PC and leverage the advantages of the internet. The LSP is then provided with a PC, printer, internet camera, microphone, power back-up and CorDECT, an indigenous technology, based connection for phone and data access. The LSP sets up a kiosk with these facilities, and also has a loan with a grace period of three months.

The choice of CorDECT as the last mile infrastructure stems around its characteristics of cost effectiveness via wireless in the local loop, and its ability to offer both a voice and data channel. Though the speeds are somewhat limited currently to only 70 Kbps when voice is not in use and half of that when it is, CorDECT provides sufficient service for these purposes, and will soon be upgraded to provide over 200 Kbps

n-Logue supports the kiosk operator with marketing techniques and training on how to attract customers to use and pay for services. They also help in creating and providing specific local content in local language. This content is not just web sites, but also, via customized video conferencing software, consultations with doctors, agricultural specialists and others across India. Villagers also have access to other services like matrimonial, video mail, e-learning, e-governance, personal financial services, and of course general websites if the customer so desires.

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[39] n-Logue Communications Pvt. Ltd.; Telecommunications and Computer Networks (TeNeT) Group, IIT Madras

This set of services has created significant changes in the lives of individuals who interact with it. At first most villagers are reluctant to pay, but once they see the magic that it can create in their lifestyles, and how it can save entire crops or even someone's life, they increasingly become repeat users. The role of the local operator as translator, guide and advisor helps bring ICT to the daily lives of those in the community. The sustained speeds and reliable connection also have huge impact in the willingness of reuse.

This setup has been established in over 1,000 locations, and is quickly growing. Because of the infrastructure, equipment and technology used, each kiosk needs to generate only Rs. 3,000 per month to be profitable. At this level each kiosk is self-sustaining, and paying off the loans incurred by infrastructure and equipment expenses.

Though there are limitations on the bandwidth CorDECT, in its current form, may offer, it's a step in the right direction. n-Logue has combined this with an effective deployment of the LSP model to create a small information revolution of its own. This type of business model can definitely be carried forward and used to create explosive growth in less privileged areas, whether rural or urban.

Gyandoot[40]

Gyandoot is a unique Public Private Partnership program. There are three entities involved in this endeavor: Gyandoot Samiti, the district government, and the kiosk manager. Gyandoot Samiti is a non-profit organization, while the kiosk manager is a private individual, typically a local entrepreneur. The District Magistrate is the president of the Samiti and the Samiti has the Chief Executive Officer of the district council as its Secretary. Additionally, the Samiti has appointed a program manager who draws his salary directly from them. One unique feature of the project is the complete financial independence of the Gyandoot Samiti from the State government, where the government plays the role of a facilitator and ensures timely delivery of e-governance services.

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[40] Case Study: Project "Gyandoot", India, Report of APT Study Question 1.5, Sanjay Dubey, Naveen Prakash, Gyandoot Samiti, August 2002

The kiosks are linked to a central server located at the district council's office through optical fiber & copper cables using dial-up connections. All of these kiosks are situated at central locations like weekly markets or village council offices. Thirty-five different e-governance, e-commerce and e-learning services are presently offered by Gyandoot. These services are chosen through a process participated in by the community, government officials and the Gyandoot team. Each service carries nominal charges set on the principle of opportunity cost but keeping in view the affordability of the region.

Over a period of 2 years, the achievements of the Gyandoot project have been remarkable. It has doubled the number of private kiosks from 9 to 18 while the population coverage has increased from 5 million to 10 million. The income levels of kiosks have increased significantly, in addition to computer literacy and IT awareness in each district. Tribal farmers are now able to get better returns for their agricultural produce by utilizing the services offered, while the project itself has employed more than 40 persons directly. In the relevant districts, computer literacy amongst government employees has grown from a mere 2% to 60%.

Appendix 2.   CII National Broadband Economy Committee Recommendations[41]

The Confederation of Indian Industry National Broadband Economy Committee has executed a detailed study in conjunction with the Department of Information Technology and Department of Telecom, in partnership with various stakeholders in the broadband value chain. IBM Business Consulting Services commenced the study in September 2003 and prepared both an interim discussion paper and a final set of recommendations. These final recommendations were released in March 2004.

CII's efforts covered a wide set of subjects with suggestions for all stakeholders, including large and small operators, various government departments, and TRAI. The topics included international experiences in broadband, a demand estimation study, technology options and business models, deployment of content and applications, broadband deployment in public services and rural India, evolution of the industry structure, and estimation of the economic benefits of widespread broadband on the Indian economy.   The demand estimation study was a detailed exercise that attempted to understand the Indian environment and consumer in terms of their need and willingness to pay for broadband connectivity and various services and applications on that platform. It was the first such study of its sort, and has indeed served as valuable input.   This chapter summarizes some of the main topics covered by the CII final recommendations.

The basic guiding principles in creating the vision and roadmap that is outlined by the CII include ensuring mass market usage of broadband access and services, eliminating the digital divide either through access at home or through public kiosks, enabling viable business models to promote private investments and entrepreneurship, and creating choices for users, content / application providers and access service providers.

According to CII, the benefits from broadband will be on account of introduction of new applications that will take advantage of the ability to combine voice, video and data

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[41] "India's Broadband Economy: Vision 2010; Vision, Strategies, Recommended Action", Confederation of Indian Industry, Department of Information Technology and Department of Telecommunications, Prepared by IBM Business Consulting Services, March 2004

interactivity, in addition to enhancing existing internet applications. CII has defined these as broadband enabled applications (including digital entertainment, e-education, tele-working, video conferencing, and tele-medicine) and broadband enhanced applications (including faster web and e-mail access, e-commerce, and IP telephony).

Internationally, high levels of ICT have correlated to high levels of GDP per capita, and ICT has made significant contributions to increasing labor productivity and GDP growth. Typically, the biggest impact from broadband services has been on the unorganized sector, which includes SME's and SOHO's. While the larger corporations already have high speed wide area networks, even though they are at high costs today, the smaller entrepreneurs have no access to network connectivity. In OECD countries, it has been observed that ICT investments have led to a 44% higher growth rate in labor productivity. CII has estimated that investment in broadband technologies and roll-out, itself, in India could account for 11% of additional growth in labor productivity. The benefits are drawn from lower response time when conducting business, allowing for improved fulfillment rates and timing, greater efficiency in communication and interaction, and a significant impact on education. In terms of education, specifically, the country gains from having more individuals with at least a basic level of education, as well as an improvement in the output of individuals by providing higher quality in that basic level.

In terms of the effect on employment, broadband will create a significant number of new jobs because this will be a new industry. Furthermore, there would be a boost to the number of people who could join the workforce since broadband introduces the ability to work remotely either from home or from business centers that do not have to be located in the major metros. This will also lead to a rise in the number of individuals who can work part-time. The estimated total increase from direct employment as well as from supporting employment in the broadband sector is 62 million people by 2020. The estimated present value (2004) of total impact on overall GDP during the period 2010 – 2020 is expected to be US$90 billion.

As part of the demand estimation exercise, CII conducted both qualitative and quantitative studies across the top 35 cities to arrive at their conclusions. Focus group discussions were used to understand the mindset of consumers and what are the drivers and inhibitors for broadband penetration. Market research was also conducted in 10 cities,

and then extrapolated to represent the country as a whole. The market was segmented into households, SME's, SOHO's, corporates and cyber cafes, while also incorporating an aggregate projection for rural connectivity. Performance of other similar products and estimates of the result of network effects in increasing familiarization of broadband services was then used to estimate long term saturation rates. Analysis was also performed to determine the demand of each individual application at different price levels. For the corporate sector, inputs were also taken from companies on their own predictions of the need for broadband connectivity and application usage. This process combined led to CII's goal of achieving at least 10 million broadband subscribers by 2010. Please refer to Table Appendix 2-1 below.

Table Appendix 2-1 – CII Broadband Subscriber Targets

Year Ending	Broadband Subscribers Target
2006	3.35 Million
2010	10.1 – 10.6 Million
2020	32 – 39 Million

Segment	2004	2005	2006	2007	2008	2009	2010
Corporate	46	107	175	249	328	414	505
SME	35	93	167	259	371	508	672
SOHO	15	41	80	135	210	309	436
Cyber Café	43	82	102	126	155	191	236
Household	747	1,479	2,838	4,327	5,601	6,727	7,596
Total	**886**	**1,802**	**3,361**	**5,095**	**6,666**	**8,150**	**9,445**[42]

(Subscribers in thousands)

The demand projections for the residential segment are based on a package comprising of 1.5 Mbps always-on broadband service with unlimited download. The optimal price was determined based on maximizing the return for broadband service providers matched against the demand curve that was generated from the research. This optimal price comprises of an up-front payment of Rs. 5,000 and a recurring monthly payment of Rs. 800, which consists of Rs. 600 for access costs, Rs. 100 rental for set top box and CPE, and Rs. 100 for broadband TV subscription. CII envisages that the price for access will drop over time, but that ARPU will remain constant at Rs. 800 since increasing amounts will come from provision of paid content services like video on demand.

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[42] Note: The remaining difference is covered by the number of rural kiosks and primarily by multiple seats at urban kiosks / cyber cafes.

In addition, CII has recognized that the possibility for discontinuous changes in the environment exists. This is one of the reasons why they have set their goals as minimum numbers. For the market research analysis, though, they specifically ruled out these types of changes because of the number of unknowns that it would introduce. Discontinuous changes could include a substantial drop in PC, access device, or CPE equipment prices, restructuring of the cable industry to deliver required QoS for high speed internet services, changes in technology and industry structure that lead to even lower prices, and the ability of operators to finance the Rs. 5,000 entry cost.

When arriving at their targets, CII envisaged coverage to start in the top 8 cities, and then spread to the top 35 cities, which is all cities with population greater than one million, by 2005. The smaller towns are only reached starting 2006, and by 2010, over 350 of them are expected to be covered. Furthermore, over 50% of the rural population is expected to have access to broadband connectivity by 2010 through kiosks.

According to CII, key factors that could change their overall demand estimates are based on offering the right pricing, having a good pace of roll-out with effective competition existing in each market, a decreased price of PC's and access devices, meeting certain quality of service levels, significantly decreased levels of duties and taxes, and the development of appropriate online applications and content for medium and long-term attractiveness for subscribers.

CII found that the most popular applications for broadband are going to be video on demand, music downloads, online gaming, online education including online corporate training, and video chat. Video on demand, though, today has the highest demand amongst both PC owners and non-PC owners. This application is likely to have the highest level of popularity in terms of paid content as consumers can already relate to entertainment through movies, unlike other applications like online education, gaming, etc. CII has found that consumers are willing to pay Rs. 20 per movie.

In terms of business models for delivering access, CII looked at four alternatives. In each alternative, a significant portion of investments has to be made in the core infrastructure, both within cities as well as for national backhaul and connectivity. The infrastructure

also accounts for high levels of QoS, investment in content distribution networks for provisioning television and video on demand services, among other things. CII's analysis shows that DSL over existing copper and cable modem services on HFC networks with upgraded cable show the most financial promise over a 10-year outlook with IRR of 21%. A fresh rollout of fiber with Ethernet is also promising, with an IRR of 19%, while DSL over a new copper roll-out is most likely not worthwhile under current situations. Incumbent DSL operators seem to have a better case than cable operators or competitive DSL providers since they do not make a payment for accessing the line that they own because it is just an internal transfer. On the other hand, cable operators have to pay for infrastructure upgrades and access seekers have to pay for using the copper line. CII estimates that a total investment of at least US$2.6 billion is needed by 2006 and US$5.35 billion by 2020 to achieve the goals they have set for broadband services. This includes investment in urban networks, domestic and international backhaul, content delivery mechanisms, content and application development, and rural build-out. The content and applications would include a full gamut of services including education, health, governance, local language web content, and new broadband-based entertainment like games and videos.

In terms of the role of the Government and Regulator, CII specified a number of steps that need to be taken to enable broadband growth to occur successfully in the country. These suggestions have served as inputs to the recommendations the Authority has made in this document. CII's suggestions include:

- Taking steps to reduce by up to 75% the prevailing prices of international and domestic bandwidth prices by 2006
- Mandating interconnection for all broadband services with a national backbone
- Enabling local loop unbundling through a system of managed open access on the incumbents' copper networks
- Releasing unlicensed and licensed spectrum in the 2.5 GHz, 3.5 GHz and 5 GHz bands
- Promoting state level agreements for right of way in exchange for bandwidth for government requirements
- Mandating standards for cable networks to make them broadband capable

- Mandating and enforcing QoS standards for broadband service providers with the regulator conducting periodic audits, publishing results and penalizing violators

- Introducing digital copyright and conditional access protection / enforcement laws based on proactive prevention (along the lines of the EU Digital Copyright Directive 2001)

- Extending cyber laws on privacy and fraud to cover all media for broadband services

- Allowing a full convergence of services, regardless of technology or underlying media

- Allowing for sharing, leasing, trading, sale and transfer of licenses, spectrum, bandwidth and other resources among industry players

- Extending FDI limits to all parts of the broadband industry value chain to attract overseas investments

CII also made specific recommendations for fiscal policy steps that need to be taken:

- Providing all broadband infrastructure and service providers, regardless of underlying technology or media, with a 10 year income tax waiver, as provided for IT companies

- Exempting CO equipment and CPE's, including STB's and PC's from all customs and excise duties including CVD, special duties and sales tax

- Exempting broadband services for the next 10 years from payment of service tax

- Instituting a tax exempt broadband allowance for users, with the amount being tax deductible for paying organizations

- Treating investments in Broadband Experience Centers as R&D expenses so they have tax free status

- According soft infrastructure status to digital content (education, health, governance, local language, web content, interactive entertainment) to enable incentives and interventions

- Providing educated unemployed youth who wish to set up broadband kiosks with easy financing options and support from the various self employment / entrepreneurship development funds

Finally, CII also made suggestions about how to promote rural build-out of broadband as well as enable and lead deployment in public services. These suggestions include treating rural service provision under special rules where no licensing is required and immediate deployment of triple play packages is allowed. They also suggested providing funding from the USO fund for development of rural broadband networks. CII also made suggestions about direct procurement of agriculture being allowed without the overheard of mandi taxes and other restrictions. CII has also called for the Government to implement certification programs for e-education courses with clear standards on systems and content. They also suggest that the Government take the lead in creating time bound plans for leveraging ICT in education and health services, and deploying e-governance.

Appendix 3.   Justifying Satellite for Broadband Services

Satellite services are well-suited for a variety of situations. Their use in remote or rural areas where there are few other options for connectivity is well-known. Because of the country-wide footprint that can be achieved with a single satellite, its signals can reach places where wire-based and terrestrial wireless connectivity does not exist. Beyond just servicing remote locations, satellite services can also be very useful to serve as a distribution point for a commercial complex, or a multi-dwelling building or community. Additionally, this technology is well-suited for back-up connectivity as it provides 99.99% reliability and is not prone to power outages, cut lines, bad weather, etc. Finally, satellite connectivity is also advantageous when broadcasting / multi-casting the same information to multiple parties, e.g., a nightly update for banks and other industries that do batch processing, media distribution, and even live interactive e-learning. Typically, outside of clearance delays, commissioning high bandwidth satellite connectivity can take significantly less time than other forms of last mile access methods, and this combined with its reliability is what makes it also very useful in disaster recovery scenarios.

Based on the varying needs of users, in certain situations satellite connectivity can prove to be the most economically efficient technology to use because of these advantages. An installed base of over 700,000 VSAT's around the world in 2003, with over 56% of these in an area as networked as North America, demonstrates the significant applicability of this technology.[43] The 33,000 VSAT's installed in India shows that there is significant room for growth, and an opportunity to propel growth of broadband using this medium.[44]

The consultation process surfaced some obstacles that providers of VSAT and DTH services are facing today. These bottlenecks are restraining their growth and ability to contribute to the growth of internet and broadband penetration.

VSAT operators demonstrated during the consultation process that if the proper regulatory framework is created, significant cost savings can accrue to them and therefore

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[43] Communications Systems Ltd UK, June 2003; VSAT Services Association of India, March 2004
[44] VSAT Services Association of India, March 2004

be passed on to end-customers which would improve the affordability of this medium. The VSAT operators submitted that they can save over 35% in cost per Kbps of bandwidth by being allowed to use more advanced foreign satellites through their own negotiation process and business terms, like ISP's and broadcasters are allowed to do. Further, cost savings / value addition can accrue from relaxing and/or completely lifting artificial limitations on technical aspects of the operations, e.g., maximum throughput and minimum satellite dish size. The cost of a 75 cm dish is 45% cheaper than a 1.2 m one, and new satellites are being launched internationally on a regular basis that having increasing throughput capabilities. This can yield a 512 kbps internet access line that can be provided to consumers at under Rs. 1,000 per month, without even accounting for cost savings due to economies of scale that are likely to arise due to growth and the newer high capacity satellites.

Both of these cost and operational benefits can accrue directly to consumers, as well as create market efficiencies through competition among multiple providers for satellite capacity. It has also been pointed out that a number of foreign satellites already have a footprint over India and have significant spare capacity which industries in this country could take advantage of. Please refer to Table Appendix 3-1 for a table on projected available capacity over India.

Table Appendix 3-1 – Projected Ku-Band Transponder Capactity Over India 2004 to 2006[45]

Satellite	Transponders Min Available	Transponders Max Available
Europe*Star	4	6
NSS	7	10
Intelsat	6	10
Singtel	3	5
GE	6	10
INSAT	12	12
Thaicom	1	3
Asiasat	4	8
Total	**43**	**64**

[45] Source of table: Europe*Star, February 2004. Note: Table does not include the capacities which would have a very low power/look angle and may be commercially unsuitable for Commercial Data, Voice and Video Business. Additionally, table does not include Helasat, Russian Satellite (non-coordinated and yet to be launched).

Appendix 4.   Current Levels of Duties

Despite steps during the release of the mini-budget in January 2004, equipment for provision of internet and broadband still has high duties associated with it. The new policies in the mini-budget stipulated that the 4% special additional duty (SAD) is abolished, peak custom duty is reduced from 25 to 20%, specified infrastructure equipment in List 22 for basic / cellular / internet / VSAT and paging are exempt from basic duty, excise duty on computers is reduced from 16% to 8%, and that laptops brought as part of baggage are exempted from customs duty. Please refer to the tables below for a list of applicable equipment the associated levels of duties.

Equipment for Provision of Broadband and Internet Services[46]

Exim Code	Item Description	Customs Duty Before 8 Jan 04				Customs Duty After 8 Jan 04			
		Basic	CVD	SAD	Effective	Basic	CVD	SAD	Effective
		(%)	(%)	(%)	Duty (%)	(%)	(%)	(%)	Duty (%)
	For purposes of comparison								
	Cellular Phone Handset	10	16	4	32.7	5	0	0	5.00
	Select items under the existing List 22								
8517 30 00	ATM, Frame Relay & Ethernet Switches	5	16	0	21.80	0	16	0	16.00
8517 50 00	Apparatus for Carrier Current Line or for Digital Line System	5	16	0	21.80	0	16	0	16.00
8517 50 04	HDSL Systems	5	16	0	21.80	0	16	0	16.00
8517 50 00.10	DWDM Equipment	5	16	0	21.80	0	16	0	16.00
8517 50 93	Routers	5	16	0	21.80	0	16	0	16.00
8525	Radio Commn. Eqpt. (Incl VHF/UHF & Microwave Commn. Eqpt of Base Transreceivers Stations (BTS))	5	16	0	21.80	0	16	0	16.00
8525 20 11	Satellite Commn. Eqpt - Radio with LNA, up & down Converters,	5	16	0	21.80	0	16	0	16.00
9030 39 11	Network Management Stations	5	16	0	21.80	0	16	0	16.00
	Computers for billing & customer services	5	16	0	21.80	0	16	0	16.00
	Short message service hw/sw / voice mail service hardware	5	16	0	21.80	0	16	0	16.00
	Automatic call distribution system	5	16	0	21.80	0	16	0	16.00
9030 39 12	Transcoders	5	16	0	21.80	0	16	0	16.00
9030 39 17	Test Equipment	5	16	0	21.80	0	16	0	16.00

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[46] Internet Service Providers Association of India, March 2004. Note: Duty for cellular phone provided as point of comparison for target levels of broadband and internet equipment. Items in List 22 are exempt from Basic Duty.

Exim Code	Item Description	Customs Duty Before 8 Jan 04				Customs Duty After 8 Jan 04			
		Basic	CVD	SAD	Effective	Basic	CVD	SAD	Effective
		(%)	(%)	(%)	Duty (%)	(%)	(%)	(%)	Duty (%)
	Suggested List of Customer Premises Equipment (CPE) for consideration of lowest customs duty								
8517 80 00	VoIP Devices such as H.323 Terminal / SIP Terminal /	15	16	4	38.74	15	16	0	33.40
8517 80 20	Subscriber end Eqpt (Modem+Ethernet)	15	16	4	38.74	15	16	0	33.40
8517 50 30	Modems	15	16	4	38.74	15	16	0	33.40
8517 80 30	Set Top Boxes	15	16	4	38.74	10	16	0	27.60
8517 50 91	ISDN Terminals	15	16	4	38.74	15	16	0	33.40
8517 50 92	ISDN Terminal Adapters	15	16	4	38.74	15	16	0	33.40
8525 20 09.10	Wireless LAN Equipment (Incl Wi-Fi)	15	16	4	38.74	15	16	0	33.40
85.17	Networking cables	15	16	4	38.73	15	16	0	33.40
85.17	Media Converters	15	16	4	38.73	15	16	0	33.40
85.17	Modems (DSL/Cable)	15	16	4	38.73	10	16	0	27.60
8471	Computer	15	16	4	38.74	10	8	0	27.60
8473.30	Parts of Computers (PPCBs) incl motherboards (w or w/o CPU)	5	16	4	26.70	5	16	0	21.80
8473.30	Parts of Computers (other than PPCBs incl CPU)	5	16	4	26.70	5	16	0	21.80

Exim Code	Item Description	Customs Duty Before 8 Jan 04				Customs Duty - After 8 Jan 04			
	Suggested List of Networking / Other Eqpt for Consideration of Lowest Customs Duty	Basic	CVD	SAD	Effective	Basic	CVD	SAD	Effective
		(%)	(%)	(%)	Duty (%)	(%)	(%)	(%)	Duty (%)
8471	Remote Access Servers, Universal Access Server	15	16	4	38.74	15	16	0	33.40
8471 80 00	Other Unit of Automatic Data Processing Machines Incl. Firewall / Intrusion Detection Systems	15	16	4	38.74	15	16	0	33.40
8471 90 00	Others incl. Luna Token (high security H/W Cards)	15	16	4	38.74	15	16	0	33.40
8517 50 05	Digital Loop Carrier Systems (DLC)	15	16	4	38.74	15	16	0	33.40
8525 20 00	Transmission Apparatus Incorporating reception apparatus	15	16	4	38.73	15	16	0	33.40
8525 20 11 20	Satellite Receivers	15	16	4	38.73	15	16	0	33.40
85.28	Satellite Recievers for Cable TV	20	16	4	44.76	20	16	0	39.20
84.71	Servers for LAN BASED INTERNET PIV & Xeon based .	10	16	4	32.70	10	8	0	18.80
8544.41/49	Cable with end connectors less than 80V	10	16	4	32.70	10	16	0	27.60
8544.51	Cable with end connectors 80-1000V	10	16	4	32.70	10	16	0	27.60
8525.20	Transreceivers	15	16	4	38.73	15	16	0	33.40
8529.90	Parts of Transreceivers other than PCBs	5	16	4	26.67	5	16	0	21.80
8529.90	Parts of Transreceivers PCBs	10	16	4	32.70	10	16	0	27.60
8523.20.2	Floopy Diskettee	10	16	4	32.70	10	16	0	27.60
8524.40	Magnetic Tapes	5	16	4	26.67	5	16	0	21.80
9030.40	Tersting Equipment for Telecom	15	16	4	38.73	15	16	0	33.40
85.44	Coax Cable	20	16	4	44.76	20	16	0	39.20
85.43	RF Amplifier	20	16	4	44.76	20	16	0	39.20
85.43	High Pass Filter	10	16	4	32.70	10	16	0	27.60
85.43	RF Node	20	16	4	44.76	20	16	0	39.20
85.25	Optical Transmitter	20	16	4	44.76	20	16	0	39.20
85.44	Coax Cable Coaring Tool	20	16	4	44.76	20	16	0	39.20
85.44	Coax Cable Preparation Tool	20	16	4	44.76	20	16	0	39.20
85.44	Crimping Tool	20	16	4	44.76	20	16	0	39.20
90.01	Optical Fiber Cable	20	16	4	44.76	20	16	0	39.20
90.15	Optical power meter	20	16	4	44.76	20	16	0	39.20
90.15	Optical Time Domain Reflectometer	20	16	4	44.76	20	16	0	39.20

Equipment for Manufacturing of Broadband and Internet Services[47]

Equipments, Accessories & Finished Products

Item description	HS Code	Levies				Total Reduction (%)
		Before announcement of mini budget		After announcement of mini budget		
		BD+CVD+SADD	Total	BD+CVD+SADD	Total	
Line Telephone Set/Fax M/C	8517.11 8517.21, 8518.3	15+16+4	38.736	10+16+0	27.600	11.136
Modem, Routers, FWT	8517	10+16+4	32.704	10+16+0	27.600	5.104
Carrier-Current Line Eqpt. (Multiplexers, HDSL, DLC, SDH)	8517.50	15+16+4	38.736	15+16+0	33.400	5.336
Transmission Eqpt for Radio Telephony	8525.10	15+16+4	38.736	15+16+0	33.400	5.336
Measuring Instruments Oscilloscope, Spectrum Analyser, Network Analyser	9030.20 9030.39	25+16+4	50.800	20+16+0	39.200	11.600
Telecom Special Instruments (Crosstalk Meter etc.	9030.40	15+16+4	38.736	10+16+0	27.600	11.136
Specified Telecom Equipments by Operators.	84, 85 & 90	5+16+4	26.672	0+16+0	16.000	10.672
Coaxial Cables, Wires	8544.20 8544.49	25+16+4	50.800	10+16+0	27.600	23.200
Optical Fibre Cables	8544.70	20+16+4	44.768	15+16+0	33.400	11.368
Lead Acid Battery	8507.10	25+16+4	50.800	20+16+0	39.200	11.600
Antenna	8529.10	10+16+4	32.704	5+16+0	21.800	10.904

[47] Telecom Equipment Manufacturers Association, March 2004

Components, Raw Materials & Parts

Item description	HS Code	Levies				Total Reduction (%)
		Before announcement of mini budget		After announcement of mini budget		
		BD+CVD+SADD	Total	BD+CVD+SADD	Total	
Parts						
Parts of Line Eqpts.	8517.90	5+16+4	26.672	5+16+0	21.800	4.872
Parts of Transmission Eqpt.	8529.90	5+16+4	26.672	5+16+0	21.800	4.872
Parts of specified Telecom Equipments		5+16+4	26.672	0+16+0	16.000	4.872
Components						
Capacitors: Tantalum, Multilayer	8532.21 8532.24	0+16+4	20.640	0+16+0	16.000	4.640
Capacitors: Elec.,Single Layer , Mica., Variable.	8532.22, 8532.23 8532.29 8532.30	15+16+4	38.736	10+16+0	27.600	11.136
Resistor- Fixed, Variable & Potentiometer.	8533.10 8533.29	15+16+4	38.736	10+16+0	27.600	11.136
PCB- Blank & Populated	8534.00	10+16+4	32.704	10+16+0	27.600	5.104
Fuses, Switches, Connectors, Relays	8536.10 8536.90	15+16+4	38.736	10+16+0	27.600	11.136
Plugs, Sockets	8536.90	15+16+4	38.736	10+16+0	27.600	11.136
Diodes, LED, Transistors, LASER Diodes.	8541.10	15+16+4	38.736	10+16+0	27.600	11.136
IC, Hybrids	8542.00	0+16+4	20.640	0+16+0	16.000	4.640

Miscellaneous Electro-Mechanical Items

Item description	HS Code	Levies				Total Reduction (%)
		Before announcement of mini budget		After announcement of mini budget		
		BD+CVD+SADD	Total	BD+CVD+SADD	Total	
Electro Mechanical Parts – Ringers, Buzzers, Elements etc.	8531.96	25+16+4	50.800	20+16+0	39.200	11.600

Raw Materials

Item description	HS Code	Levies				Total Reduction (%)
		Before announcement of mini budget		After announcement of mini budget		
		BD+CVD+SADD	Total	BD+CVD+SADD	Total	
Rubber and Plastic Raw Materials	3903.30 / 4016.95	25+16+4	50.800	20+16+0	39.200	11.600
Petroleum Jelly, Polymers	39.11, 27.12, 34.04	25+16+4	50.800	20+16+0	39.200	11.600
Copper Wire, Rods, Bars	74.07, 74.08	25+16+4	50.800	20+16+0	39.200	11.600

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