The Dynamics of Broadband Internet Market in Pakistan

Amir Manzoor
Management Sciences Department, Bahria University, Karachi, Pakistan
amirmanzoor@yahoo.com

ABSTRACT

During the past few years, Pakistan witnessed a remarkable development in broadband Internet connections. However, the broadband Internet in Pakistan has still not achieved its optimal growth. This study explores the factors hampering the development of broadband Internet. The paper first presents the recent broadband Internet trends in Pakistan. The broadband Internet market in Pakistan is characterized by fierce competition and this competition has led to a faster broadband rollout in Pakistan. The situation represents serious challenges for both service providers and policy makers. At the same time, policy makers and industry leaders need to work on first creating a broadband network infrastructure and then the capacity to create and administer an enabling environment.

Key words: Broadband, Internet, Last mile, Local Loop Unbundling

1. INTRODUCTION

The last mile is the last segment of the telecommunication pipeline that connects data from a telecommunication provider and end-customers. Last mile technologies used in telephony services are based on twisted pair copper wires. With the growth of Internet, the last mile has become a decisive factor with respect to the quality of service. With consumers demanding faster and more reliable connections, the last mile has become a serious bottleneck hampering the development of faster Internet technologies and electronic business.

Various technologies have surfaced to overcome the last mile problem. One such technology is ADSL (Asymmetric Digital Subscriber Line) that uses existing copper line. As such any house with a telephone line can use broadband Internet. However, ADSL technology is distance-limited and can only work within a certain radius from the telephone exchange. Cable modem is another technology that utilizes the existing cable infrastructure to provide television and phone services. In addition, wireless and satellite technologies are also available [1][2]. These faster and always-on broadband technologies are not only changing the patterns of Internet use but also providing a platform for electronic commerce.

The deployment of broadband Internet varies across the globe. A recent report by Website Optimization LLC, a leading website optimization firm, placed Pakistan fourth on its broadband ranking list for South Asia [3]. At the end of 2011 there were almost 1.5 million broadband subscribers in Pakistan with a penetration rate of about 0.88% [4].

Bridging the last mile and deploying broadband connections involve not only technology, economics and geography, but also politics and policy [1]. This study investigates the development of broadband Internet connections in Pakistan in the last two years and its contributing factors. There exist many country-level broadband Internet (or Internet) studies. Analyzing seven developed countries, [5] found a significant role of national culture in the policy decisions and development of country-level information infrastructures. Comparing the adoption processes of the broadband access in the United States and Korea, [6] found that the combination of government's ICT policy and the unique cultural traits was the driving force behind the rapid diffusion of the broadband access. Examining the factors that encourage Internet diffusion across OECD countries, [7] established that the most significant predictors of country-level Internet uptake were the country's economic wealth and telecommunications policy. Using Porter diamond model to analyze broadband service industry in Pakistan and India, [31] found that all factors of diamond model cumulatively impact each other to gain national competitive advantage. [8][9] found that infrastructure competition and removing differences in broadband Internet access was the most viable factor governments could use for the faster broadband Internet uptake. It also emphasized the importance of more competitive environment for the dominant broadband market leaders (through policies such as local loop unbundling and line sharing) as secondary necessary step to boost broadband Internet diffusion.

The studies cited, however, focused on individual factors responsible for the growth of broadband Internet (or Internet) growth. Most studies investigating the link between country's competitive advantage and growth in various broadband-related industrial sectors have compared United States with many Asian countries for example [10] and [11]. Taking Singapore as a success story of a most comprehensive and coordinated effort to promote information technology, [12] suggests that a proactive government strategy is the driving force behind the successful Internet deployment. Specifically the government policies regarding funding for

1

small and medium-sized information technology companies, adoption of global standards, special demonstration projects, and skills development are key to the Internet development at country level. While the developed countries already established policies to promote IT innovation, the process of institutionalization of policies to accelerate and support IT innovation started in various newly industrialized and developing nations [13]. Investigating broadband development in South Korea, [11] identified government leadership, fierce competition, low prices, cultural aspects, and geographic and demographic aspects as the driving factors behind broadband internet growth. Analyzing developed OECD nations, [14] [30] argues that managerial and regulatory obstacles tend to inhibit diffusion of information technology despite the availability of well-built infrastructures, computer and telecom industries, and significant resources. Investigating the patterns and problems of Internet diffusion in less developed countries, [15] suggested three barriers to the wider distribution of Internet: government policies, laws, and practices; technical barriers; and local/cultural factors.

Many analytical frameworks have been developed to understand Internet roll out and use at country level. Analyzing low and middle-lower income countries, [16] suggested a framework to assess the Internet development at country level. This framework consisted of dimensions such as government policies, national culture, country-wide information technology penetration, economic development, and national language. Analyzing in-depth studies of about 25 countries undertaken since 1997, [17] suggested a framework for assessing Internet diffusion at country level. This framework consists of six dimensions and 12 determinants, divided into three categories, which influence these dimensions. The six dimensions include sectoral absorption, organizational infrastructure, geographic dispersion, sophistication of use, pervasiveness, and connectivity infrastructure. The 12 determinants include variety of ISPs, Geography, Cost of Internet access, Ease of use of the Internet, perceived value, demand for capacity, adequacy and fluidity of resources, Culture of entrepreneurship, ability to execute, forces for change, change enablers, and regulatory/legal framework.[18] suggested that the Internet development at country level is most significantly influenced by per capita income. The two other influencing factors include openness of a society and infrastructure. Analyzing African least-developed economies, [19] suggested six factors behind the Internet development at country level. These factors include domestic and foreign investment in ICT, wireless and satellite infrastructure, self-sufficiency, government regulatory policies, local capacity, and degree of privatization of telecommunications sector.

2. RESEARCH METHODOLOGY AND DATA COLLECTION

To investigate the research questions, a case study approach will be used in this study with selected case being Pakistan. The case study approach is suitable for the topics that involve special or unique situations requiring intensive, in-depth, study [20] [21] [22] [23] [24] [25] as is the current study of Pakistan.

We collected data on the broadband Internet from various sources including press, government statistics, etc. We also interviewed eight representative figures from major players: government, industry, service providers and related associations. This approach runs the risk of being caught up in the optimistic views of the press and the persons involved in the process. But we sought to maintain a sound and balanced position to what we heard and read.

3. BROADBAND CONNECTIONS AND INTERNET USE IN PAKISTAN

First broadband connection in Pakistan was given in 2002. The projected number of broadband subscribers in Pakistan by 2009 was 643,892 and it was expected that the number will reach 1,213,000 by 2012 [4].Since Pakistan Telecommunication Authority (PTA), the telecom regulatory authority in Pakistan, enforced the deregulation policies including giving broadband licenses to private companies in 2004, many players entered into the broadband market. There were players competed in providing broadband with same technologies and there were players who dominated in particular access technology. Fixed line penetration was a significant issue in Pakistan. Fixed line penetration rate was 3.5% in 2009 and it was expected to drop to 2.8% by 2011. During the last decade, Pakistan saw sustained growth in its telecom industry (especially the mobile sector). During 2006-2007, the total mobile phone subscribers increased from 22 million to 77 million. Over the last few years, the Pakistan broadband Internet market witnessed a great deal of technological and strategic transformation. Competition in the broadband market strengthened after the introduction of a new operator Qubee (a Wireless-based broadband service provider). Soft licenses and relaxed terms and conditions from Pakistan Telecommunication Authority (PTA) facilitated access to latest broadband technologies in Pakistan. A wide range of broadband technologies (such as DSL, Worldwide Interoperability for Microwave Access (WiMAX), Fiber-to-the-Home (FTTH), Evolution-Data Optimized or Evolution-Data Only(EvDO), Hybrid fiber-coaxial(HFC)and Very-high-speed digital subscriber line 2(VDSL2)were made available to Pakistani Internet users [4] [27].

Wateen, a UAE-based telecommunication company operating in Pakistan, launched World's first largest commercial WiMAX network in Pakistan in 2007. Pakistan

2

Telecommunication Company Limited (PTCL) was the first telecom operator on the globe that used VDSL2 technology under brand name PTCL Ultra Net (with supported bandwidth of up to 50 Mbps). PTCL also deployed its first Fiber to Home service in Karachi which was based on Gigabit Passive Optical Network technology. Mobile Number Portability (MNP) project was launched in 2010 which further intensified competition in the market. Government of Pakistan established a Universal Service Fund (USF) to with the mandate of developing telecommunication services in both un-served and under-served areas of Pakistan. The funds for USF operation were contributed by telecom Operators and government provided no funding. An independent board of directors, with members from industry and consumers, was setup to run the affairs of USF. Significant contributions of USF included providing 300,000 new broadband connections and establishing more than 800 Educational Broadband Centers in different higher-secondary schools/colleges and more than 200 Community Broadband Centers in USF areas.

4. IMPORTANCE OF THE BROADBAND INTERNET

The deployment of the broadband Internet infrastructure is shaping the nature of business for many industries involved in media, communications, entertainment, and many other forms of content and interactive services delivered via conventional channels and/or the Internet. The growing availability of broadband Internet access is enhancing business growth opportunities and driving a range of new applications from movies on demand to remote medical services. At the same time, the Internet has fundamentally altered the nature of global markets as it enables people to connect to other networks, people, and businesses, free from the limitations of time and space. In fact, the diffusion of such an infrastructure is now strategically important for individual countries as it carries the potential to significantly contribute to a country's economic wealth in the emerging age of electronic commerce (e-commerce). Essentially, the broadband Internet readiness of a country affects its ability to compete globally.

5. TRENDS IN BROADBAND INDUSTRY

With the boom of mobile phones, many cellular companies entered in Pakistan market and established their networks. With the expected saturation of the mobile phone market, the cellular companies started to look at other possibilities to maintain their profitability. Internet on mobile and broadband Internet became the choice of many cellular companies. WATEEN made heavy investments in WiMAX technology while Mobilink started to follow the same route. At the same time OEM manufacturers, e.g. Motorola and Intel started to provide both technical and financial support to WATEEN and Mobilink respectively. That trend was significant as it presented immense challenge for local companies e.g. CyberNet to compete and expand in Pakistan broadband

market. Local companies decided to capitalize on their existing strongholds and not to expand in the new venues of broadband market. In summary, Pakistan broadband market is concentrated and four companies, PTCL, Wateen, WorldCall, and WiTribe collectively command over 90 % of the Pakistani broadband market, and the other companies shared less than 10 % of the market by the end of 2011 (See Table 1).

Table 1: Broadband Internet market shares in Pakistan by 2011

	PTCL (57%)
	Wateen (15%)
	WorldCall (10%)
	Wi-Tribe (9%)
	Qubee (3.1%)
	LinkDotNet (2.5%)
CR4	91 %

Source: (PTA, 2011)

As for the pace of broadband Internet development in Pakistan, Pakistan ranked as one of top countries that registered high growth rates in broadband Internet penetration among their populace, in the worldwide data report of LLC optimization for Q1 2010 to Q1 2011 [26]. Broadband Internet connections mainly consist of ADSL, Cable Internet, LAN Internet, and Wireless with Wireless broadband leading with a market share of 50.5% (See Table 2). Cable Internet is a unique service in Pakistan which provides the broadband connections for apartment blocks. Broadband access in Pakistan is perceived as one of life`s luxuries among the Pakistani population. In Pakistan, 75% of high-income persons used broadband Internet while only 15% of low-income population used the same [25].

Table 2: Market shares (%) for residential Broadband Internet Markets

Fixed	**Wireless**
49.5	50.5

Source: [4]

6. CHALLENGES FOR BROADBAND INTERNET IN PAKISTAN

Broadband Internet in Pakistan is faced with many challenges. Pakistan's geographical location and its size coupled with its cultural and social characteristics lead to a number of drivers and barriers which affect the take-up of

3

broadband by society. Based on the analysis carried on the basis of Porter Diamond, Interviews, and surveys conducted with services providers/users we were able to come up with a comprehensive list of drivers for and barriers to Broadband uptake in Pakistan. Moreover the country's progress towards information society and economy targets are a source of opportunities which will facilitate the transition from dial-up access to high-speed, always-on connection i.e. Broadband. The various challenges faced by broadband Internet can be classified into following categories.

1) Broadband Infrastructure Challenges
2) Demand Side Challenges
3) Business Related Challenges

6. 1 Broadband Infrastructure Related Challenges

6.1.2 Ubiquitous Coverage

Pakistan still lacks adequate telecommunication infrastructure required for diffusion of quality broadband service through various platforms. Pakistan currently lacks adequate telecommunication infrastructure required for diffusion of quality broadband service. Land Line penetration stood at around 3.5 % in 2009. This deficiency in basic infrastructure, required for broadband, has been addressed by utilizing Wireless technologies. Many areas still lack broadband infrastructure and a significant digital divide is apparent. For ubiquitous access, a broadband infrastructure capable of delivering broadband access across the nation is a must. Wireless technologies are facilitating access to broadband in under-served areas but the issue of ubiquitous infrastructure is still a priority.

6.1.3 Availability of Content and Services

There is a critical shortage of electronic content especially in national languages. Similar is the case with the content and services specific to broadband Internet e.g. streaming media. The development of such content and services (including e-Government, e-Commerce and e-Learning) is still a crucial area for development of broadband Internet. Without such content and services it is unlikely to further increase the broadband penetration both from the private and the public sector. The content and services satisfying the specific needs of specific target audience is a key driver for broadband development. Such content and services provide additional reasons for broadband use. The level of interactivity offered in this content and services is also an important factor to encourage users integrate the Internet in their daily lives and increase the number of daily online tasks. At the same time, the issue of Data Rights Management (DRM) warrants special attention. To protect the rights of all stakeholders (such as content creators, publishers and the users) it is imperative that digital content is available under the appropriate conditions.

6.1.4 Quality of Service

Quality of service is a significant factor to encourage users switch to broadband Internet. An increased quality of service provides users with a visible experience. This experience encourages them to explore new opportunities in broadband Internet such as video streaming, music download and e-commerce activities. Pakistani broadband Internet providers need significant improvement in their quality of service. Pakistani broadband Internet providers also need to tackle the issues of content filtering and user complaints.

6.1.5 Availability of RF Spectrum

Service providers are currently offering both wired and wireless broadband services. First problem with respect to wireless broadband was the unavailability of RF spectrum. Service provider needs to have RF spectrum in every major city or locality where the wireless Internet will be offered. RF spectrum is a very expensive resource. Although much progress has been made on this issue by PTA but availability of high frequency RF spectrum is still a big issue. High frequency RF spectrum enables high amounts of data transfer. If the rate of spectrum is lowered and unlicensed bands are opened up for broadband services. This way many cheap devices could be used to connect to Broadband internet as well which is not possible in currently opened bands of RF spectrum.

In order to accelerate further growth for wireless broadband, the Federal Communications Commission (FCC) of USA went ahead and let wireless Internet service providers (WISPs) to operate in unused spectrum space currently occupied by TV broadcasters. The proposal was aimed at giving consumers an alternative to cable and telecom broadband providers. Allowing unlicensed operations in the TV bands would extend the existing service range of WISPs since transmissions in the TV spectrum travel further and can better penetrate buildings. The FCC proposal would also permit low-power unlicensed devices such as laptop Wi-Fi cards, wireless keyboards and network routers to use what is known as the "white space" between broadcast channels 5 to 51.

Opening up of more bands of RF spectrum would allow using devices which have vendor support and tested technology. This way less R&D money will need to be spent since there will a large variety of supported devices to be used for wireless Internet. Well known devices would also bring the cost of the service down thereby driving the price of the Internet service down. In current situation this is not the case. Therefore service providers are doing their best to get a significant volume of customers to bring down the price of Broadband Internet for their customers. But if service providers want to expand the Broadband Internet to the masses they will have to use well-known, vendor supported devices or else they cannot compete on price.

4

6.1.6 Internet Peering

Peering is voluntary interconnection of administratively separate Internet networks for the purpose of exchanging traffic between the customers of each network. Neither party pays the other for the exchanged traffic instead each derives revenue from its own customers. Peering requires physical interconnection of the networks and is often accompanied by peering agreements of varying formality.

Mutual benefit of peering is what the industry calls ""reduced costs for transit services". Other less tangible motivations can include:

- o Increased capacity for extremely large amounts of traffic (distributing traffic across many networks).
- o Increased control over your traffic (reducing dependence on one or more transit providers).
- o Improved performance (attempting to bypass potential bottlenecks with a "direct" path).
- o Improved perception of your network (being able to claim a "higher tier").
- o Government regulations or the desire to avoid the appearance of being a monopoly.
- o Service providers can share their web resources (e.g. web cache) with each other. This way the consumers of different service providers can first look if their required web resource is available with any of the service providers.
- o Consumers will also get faster web access.
- o Consumers utilize less international bandwidth, so service providers can save money on international bandwidth and be able to reduce Broadband service tariff. Service providers will do less international peering with their upstream providers.

There is no direct peering among service providers in Pakistan. Peering is currently being done on Internet Exchange. There is also lake of awareness about peering. PTA needs to educate people about direct peering and its mutual benefits. The first apprehension about direct peering is that it exposes your network to others so security concerns arise.

6.1.7 Research and Development (R&D)

In the available 3.5 GHz RF spectrum different frequency ranges can be allocated for WiMAX broadband. In Pakistan, 3, 5, and 7 MHz bands are available. Availability of various bands is very important because increased bands can ensure that many devices can be available which are tested, support is available and they are cheap. With limited availability of bands this choice is limited severely thereby raising the cost of the broadband service.

Equipment used in different countries is according to their own conditions e.g. chipsets used and penetration level. In order to use vendor has to customize their devices according to particular conditions of a country. That means serious R&D money i.e. millions of dollars. No vendor will spend such huge amount of R&D money unless they see huge business opportunity. Government role is very crucial in this regard. They should invite the vendors to Pakistan, get the bids and establish their regional R&D offices in Pakistan. PTA and Ministry of IT can both play a role here. PTA can facilitate by opening up the air space and ministry of IT can allocate a portion of its budget for wireless R&D purpose.

6.1.8 Internet Bandwidth

Service providers are generally happy with the performance of PTA. PTA has taken initiatives to force PTCL to lower the prices of international bandwidth , opening up international bandwidth market, and establishment of Internet exchange. Any service provider can purchase bandwidth from anywhere. Bulk bandwidth purchase on under-sea cable was another initiative from PTA. Price of PTCL bandwidth is low as compared to international market.

PTA has taken initiative to lower down cost of Interconnects. PTA brought down the rentals of DSLAM for service providers. PTA forced PTCL to allow any DSL service provider to install its DLSM in PTCL exchange and operate over PTCL local loop for a fee. It was the part of deregulation policy of GOP to open up the telecommunication industry for competition and to allow other ISPs to work with incumbent.

6.1.9 Long Haul Network

Pakistan telecommunication market is deregulated to a significant extent but still there are hurdles. For example, PTCL is aggressively trying to monopolize a lot of things. For example if termination points are on PTCL ends than PTCL does not charge for the use of its DPLC (digital power line carrier).But if some other service provider uses PTCL's DPLC to provide Internet than PTCL charges a high per kilometer fee for using its DPLC. Service providers rely on PTCL media to provide Internet to their consumers across the country because many International bandwidth providers drop bandwidth at Karachi and not at all major cities of Pakistan. Service providers have two choices to provide Internet to their consumers across Pakistan 1) use their own long-haul network 2) Use PTCL media. Not all service providers have their own long-haul network in Pakistan which could provide both upstream and downstream data traffic. Service providers who use PTCL media to transport their Internet traffic from Karachi to other parts of the country have to pay heavy fees to PTCL. It was also PTA initiative to allow the service providers to lay down their long-haul network (Fiber-optic based) across the country. Long haul networks carry huge loads of information between cities, through mountains, and from coast to coast, creating challenges to keep the signal clear and the loss minimal.

5

Finding the most appropriate fibers that combine the lowest dispersion and smallest dispersion slope is crucial for signals to travel over long distances with minimum need for costly dispersion compensation.

6.1.10 Local Loop Unbundling

Local loop unbundling (LLU) is the regulatory process of allowing multiple telecommunications operators use of connections from the telephone exchange's central office to the customer's premises. The physical wire connection between customer and company is known as a local loop and it is owned by the incumbent local exchange carrier. PTCL is making moves to go against competitive market. PTCL is forcing DSL providers to use their DSLAM on rental basis. Service providers will have to rent DSLAM and pay line rent as well. This move of PTCL will raise the cost of other DSL service providers thus refrain them from expending their service. If PTCL reduces the rental of DSLAM and line rent then service providers can also expand their service and transfer the benefits of reduced cost to their customers in the form of reduced tariff of DSL service. Open access to PTCL exchanges to all service providers for a fee could be another initiative to boost Broadband Internet.

6.1.11 Mobile Virtual Networking

Service providers are providing mobile virtual networking. They use each other's network for a fee. In near future, besides conventional devices to access Internet, mobile phone will play a very important role in user's lives. Right now it is playing a major role in voice communication but it will play a similar role in data communication in future. Data capable mobile phones are becoming cheaper. It is believed that mobile will be the major device used by consumers for accessing Internet in future.

6.1.12 360° Service

Service providers are using a 360° service concept for Internet. They are offering dial-up Internet for low income users, DSL for middle-income users and WiMAX Internet for high end high income users. That allows service providers to extend their service coverage and gain volumes of customers.

6.1.13 Last Mile Access

Copper loop problem in DSL is another issue. It causes the bit rate to fluctuate when user is using his telephone line for both making a call and using Internet. PTCL doesn't bother with this issue because it only creates problem with data and not voice. PTCL supposed to replace the copper loop if it is not working for any application but they don't.

6.2 *Demand Side Challenges*

6.2.1 User Awareness

Lack of awareness of the internet is another factor hampering the growth of broadband in Pakistan. Awareness being the key issue in the growth of broad band can be increased by advertising. We have examples, such as Wateen Telecom which ran an extensive advertisement campaign for its successful launch of broadband Internet services. Pakistan's broadband market comprises of many segments of consumers; some are price conscious, some are brand conscious and some want a reliable service, this makes the market complex. User awareness about the broadband Internet is still very limited. Government and service providers need to sit together and formulate a joint strategy to increase user awareness. Unless this demand side intervention is made it will be very difficult to drive the demand of broadband Internet. Awareness needs to be raised especially to explain the benefits of having a broadband connection as against dial-up internet.

6.2.2 High Start-up Costs

The price of a personal computer has decreased considerably over the past years. Still a large number of citizens in Pakistan don't have a computer. For a majority of population the price of accessory devices essential for broadband Internet access still remains high. At the same time, for a large majority of population, the value proposition of these devices is still limited. The cost of accessing broadband I still high for many segments of Pakistani society.

6.2.3 Lack of Trust and Confidence

Instilling a culture of trust and security among broadband users is critical to broadband's growth potential. Confidence in online activity is the key to increasing the take-up of broadband services, as is the protection of users through the implementation of Intellectual Property Rights mechanisms and authentication procedures.

6.2.4 Lack of Flexible Pricing Structures

The broadband service providers in Pakistan still following a standard pricing mechanism based on type of broadband connection speed. This relatively inflexible pricing structure is inhibiting further uptake of broadband Internet. Such structure is insufficient to cater the needs of a variety of customer segments with varying needs and uses of broadband Internet. The future of pricing mechanisms will rely solely on the competition created by the market players. Major broadband service providers have recently reduced the prices. Other determinants, such as charges for data on volume, should be abandoned in favor of simpler strategies, such as unlimited downloads, a common practice worldwide.

6.2.5 Economic Conditions

Even with all the initiatives taken, the projected growth of broadband will still depend upon the economic conditions of future. With fragile economic conditions across the globe, service providers need to carefully examine the dependency of Pakistani trade and economy on the international community to predict the extent of influence of global economic conditions on Pakistan's economy.

6.3 Business Related Challenges

6.3.1 Lack of Quality Education / Training

There is a general lack of quality IT education/training institutes. Although Pakistani universities produce almost 5000 IT graduates per year the quality of these graduates is big question. There is mushroom growth of IT training institutes across country but very few of them are capable of imparting quality training to their students. Industry certifications are becoming increasingly important qualification for prospective employees in IT industry. However high cost of certifications and many a times unavailability of examination centers is seriously hampering the ability of youth to gain such credentials.

6.3.2 Lack of E-commerce Infrastructure

Pakistan is seriously lacking the required infrastructure for e-commerce. E-commerce regulations have not been developed or if developed have not been implemented. There is serious lack of trust within consumers when it comes to online transactions.

6.3.3 Lack of Coordination and Leadership

There exists association of Internet Service Providers, Association of Software Houses and associations in other related and supporting industries. Still there is a lack of coordination among all these entities. Leadership is needed to devise a strategy and then act upon this strategy to obtain desired results.

6.3.4 Lack of Local Broadband Hardware

Currently the choice of licensed Broadband equipment is limited. If PTA's policy is further liberalized and service providers are allowed to use any model of DSL modem than service providers can offer DSLAM on Demand. Users can get scratch card and connect their DSL modem to any service provider.

7. CONCLUSION

Pakistani policy makers and industry leaders now faced with a significant challenge shared by many developing countries. Pakistan needs to work on developing a national broadband infrastructure capable of providing ubiquitous coverage through various platforms. At the same, Pakistan also needs to develop its population able and willing to use broadband Internet. Pakistan needs to work on converting this broadband Internet usage into electronic commerce. It is a fairly tough challenge given that a vast majority of Pakistanis don't trust the online transactions for many reasons. Pakistan needs to work on developing broadband-related content and services especially in national languages. The digital divide is yet another challenge. The broadband phenomenon is largely urban and upper-class. A large part of the country is still excluded from the benefits of broadband Internet. A well-managed and planned strategy is needed to reduce this digital divide. According to [28] [29], a country needs to have two key elements in order to exploit the potential of Information and communication technologies. First, a network infrastructure and second the capacity to create and administer an enabling environment. The former provides a platform for broadband applications. The latter provides the capacity to develop applications that utilizes this infrastructure and fulfills the needs of local population. Pakistan needs to work on both. This will be the main challenge faced by Pakistani policy makers and industry leaders in the short and long-run.

REFERENCES

[1] Fowler, D. 2000. The last mile: Making the broadband connections.

[2] Goodwins, R. 2001. What is broadband? http://www.zdnet.co.uk

[3] Tribune. (2011, September). Growth in broadband: PTCL leads Pakistan to 4th place in South Asia.

[4] PTA. (2011). PTA Annual Report 2011. Retrieved May 25, 2012, from http://www.pta.gov.pk/index.php?option=com_content&view=article&id=361&Itemid=590

[5] Garfield, M.J. & Watson, R.T., 1997. Differences in national information infrastructures: the reflection of national cultures. The Journal of Strategic Information Systems, 6(4), pp.313–337.

[6] Han, G., 2003. Broadband Adoption in the United States and Korea: Business Driven Rational Model Versus Culture Sensitive Policy Model. Trends in Communication, 11(1), pp.3–25.

[7] Hargittai, E., 1999. Weaving the Western Web: explaining differences in Internet connectivity among OECD countries.*Telecommunications Policy*, 23(10–11), pp.701–718.

[8] OECD, 2001.The Development of Broadband Access in the OECD Countries, OECD Publishing. Available at: http://ideas.repec.org/p/oec/stiaab/56-en.html [Accessed May 14, 2012

[9] OECD, 2008.Broadband Growth and Policies in OECD Countries. Available at: http://www.oecd.org/document/1/0,3343,en_2649_34223_4 0931201_1_1_1,00.html [Accessed May 24, 2012

[10] Lee, H., O'Keefe, R.M. & Yun, K., 2003. The Growth of Broadband and Electronic Commerce in South Korea: Contributing Factors. The Information Society, 19(1), pp.81–93.

[11] Choudrie, J. & Lee, H., 2004. Broadband development in South Korea: institutional and cultural factors. European Journal of Information Systems, 13(2), pp.103–114.

[12] Hon, W.S., 1992. Exploiting information technology: A case study of Singapore.World Development, 20(12), pp.1817–1828.

[13] King, J.L. et al., 1994. Institutional Factors in Information Technology Innovation.Information Systems Research, 5(2), pp.139–169.

[14] Cane, A., 1992. Information technology and competitive advantage: Lessons from the developed countries. World Development, 20(12), pp.1721–1736.

[15] Goodman, S. et al., 1994. The global diffusion of the Internet: patterns and problems. Commun.ACM, 37(8), pp.27–31.

[16] Bazar, B., 1997.A Preliminary Model of Internet Diffusion within Developing Countries. Available at: http://ausweb.scu.edu.au/proceedings/boalch/paper.html [Accessed May 14, 2012

[17] Wolcott, P. et al., 2001. A Framework for Assessing the Global Diffusion of the Internet.Journal of the Association for Information Systems, 2(1). Available at: http://aisel.aisnet.org/jais/vol2/iss1/6.

[18] Beilock, R. &Dimitrova, D.V., 2003.An exploratory model of inter-country Internet diffusion.Telecommunications Policy, 27(3–4), pp.237–252.

[19] Mbarika, V.W. & Byrd, T.A., 2009. An Exploratory Study of Strategies to Improve Africa's Least Developed Economies; Telecommunications Infrastructure: The Stakeholders Speak. IEEE Transactions on Engineering Management, 56(2), pp.312–328.

[20] Bradshaw, Y. & Wallace, M., 1991. Informing Generality and Explaining Uniqueness: The Place of Case Studies in Comparative Research. International Journal of Comparative Sociology, 32(1-2), pp.154–171.

[21] Yin, R.K., 1992.The Case Study Method as a Tool for Doing Evaluation.Current Sociology, 40(1), pp.121–137.

[22] Winston Tellis, 1997. Introduction to Case Study.The Qualitative Report, Volume 3, Number 2. Available at: http://www.nova.edu/ssss/QR/QR3-2/tellis1.html [Accessed May 26, 2012

[23] Yin, D.R.K., 2002.Applications of Case Study Research Second Edition 2nd ed., Sage Publications, Inc.

[24] Gomm, R., Hammersley, M. & Foster, P. eds., 2000.Case Study Method: Key Issues, Key Texts annotated ed., Sage Publications Ltd.

[25] Dul, J. &Hak, T., 2007.Case Study Methodology in Business Research, Butterworth-Heinemann.

[26] Dawn.com. (2011, November). Pakistan among top countries registering high broadband growth.

[27] Ahmed, M. &Anoud, 2011.Effects of Various Cultural Attributes on Web Browsing Behavior of Developing Countries' Online Community. , 2(1).

[28] Mansell, R. and Wehn, U. 1998. Knowledge Societies: Information Technology for
Sustainable Development, Oxford: Oxford University Press

[29] Van Audenhove, L., Burgelman, J., Nulens, G. and Cammaerts, B. 1999. Information society policy in the developing world: a critical assessment. Third World Quarterly, 20 (2), pp. 387-404.

[30] Lee, C. & Chan-Olmsted, S.M., 2004. Competitive advantage of broadband Internet: a comparative study between South Korea and the United States. Telecommunications Policy, 28(9–10), pp.649–677.

[31] Manzoor, A. Broadband Internet Development and Economic Growth: A Comparative Study of Two Asian Countries. IOSR Journal of Business and Management (IOSRJBM), Volume 1, Issue 6 (July-Aug. 2012), PP 01-14