DRAFT

Discovering Demand: Lessons from Wireless Competition in Asia and Africa

Professor Heather E. Hudson[1]
Director, Telecommunications Management and Policy Program
University of San Francisco

1. The Digital Divide

1.1. The Broadband Divide

Analysis of gaps in access to telecommunications has typically focused on voice telephony. The good news is that access to voice services has improved dramatically, thanks largely to newly available and more affordable wireless (mobile) services in many developing countries. The bad news is that broadband, a key requirement for productive Internet access, is still unavailable and/or unaffordable in most of the developing world. Table 1 shows the gap in Internet access between the industrialized and developing worlds. More than 85 percent of the world's Internet users are in developed countries, which account for only about 22 percent of the world's population. Of course, Internet access requires both communications links and information technologies, particularly personal computers or networked computer terminals. While there is still much less access to telecommunications in developing countries than in industrialized countries, at present, the gap in access to computers is greater than the gap in access to telephone lines or telephones. High income countries had 22 times as many telephone lines per 100 population as low income countries, but 96 times as many computers.

Table 1: Internet Access Indicators

Region	Tel Lines /100	PCs /100	Internet Users/10,000
Africa	6.0	1.2	99.6
Asia	12.1	4.0	557.6
Americas	35.3	27.5	2421.0
Europe	40.9	20.0	2079.0
Oceania	40.4	38.9	3330.5
World	18.0	9.2	972.2

Derived from ITU, *Basic Indicators and Internet Indicators*, 2002.

[1] Professor and Director, Telecommunications Management and Policy Program, University of San Francisco. E-mail: hudson@usfca.edu; phone: 1-415-422-6642; fax: 1-415-422-2502.

2. The Explosive Growth of Wireless

In developing countries without sufficient wireline infrastructure, wireless personal networks can be used for primary service. In many developing regions, wireless growth has been explosive, with mobile phones becoming the first and only telephones for many new subscribers. In Africa, and in many developing countries of Asia, now more than half of all subscribers are wireless subscribers.

Table 2: Wireless Access Indicators

Region	Wireless subscribers/ 100	Wireless subscribers/ all subscribers
Africa	2.9	52.8%
Americas	26.1	42.6
Asia	9.3	46.0
Europe	23.3	51.9
Oceania	45.0	52.9
World	15.5	47.4

(Derived from ITU data for 2001)

While wireless penetration is greatest in industrialized countries, the number of wireless subscribers as a percentage of all subscribers is very high in many developing countries where wireless phones are often the first and only phones for new customers. This is true even in many of the poorest developing countries, such as Cambodia, Indonesia, and Bangladesh in Asia and Benin, Burkina Faso, Rwanda and Uganda in Africa. See Table 3.

Table 3: Developing Countries/Emerging Economies with More Wireless than Fixed Lines

Region	Number of countries
Africa	38
Asia	24
Latin America /Caribbean	22
Europe	12

(Derived from ITU data for 2002)

Wireless can also be used for public access. For example, cellular operators in South Africa were required to install 30,000 wireless payphones within five years as a condition of their license.[1] This policy, plus rollout requirements placed on Telkom, the monopoly fixed operator, contributed to a significant improvement in access to telephone service. By 1998, 85 percent of South Africans, including 75 percent of those living in rural areas, said that they had access to a telephone. In townships and rural areas, access typically meant an available payphone within a

short walk.

Yet these wireless services provide very limited bandwidth, typically a maximum of 9600 bits per second. They can be used for text messaging and simple e-mail, but are not really suitable for Internet access (although cellular service has been used for Internet connectivity at a Uganda telecenter where no fixed line service was available). They may, however, provide lessons about how to extend broadband services in developing regions.

3. Getting to Broadband

3.1. Lessons from the Wireless Explosion

Several lessons can be learned from the dramatic expansion of wireless and growth of wireless users in the developing world. Wireless technology has the advantage of being faster and cheaper to deploy in many instances than wireline technologies. However, cellular services have been around for two decades, and growth did not take off until prices were lowered. *Competition* is the key driver of the wireless explosion. Wireless competition has resulted in innovative pricing and service offerings. Rechargeable smart cards make phone service accessible to people without bank accounts or credit histories. Cheap messaging can substitute for many e-mail functions. For example, the Philippines is now the world's largest user of SMS (short message service). And demand in developing regions has been shown to be much greater than many operators assumed.

Note that pricing for SMS in developing regions is typically lower than in industrialized countries, perhaps in response to perceived demand and ability to pay for text messaging. However, Internet access is much more expensive in developing countries; in lower income countries, users pay nearly twice as much for dial-up access as in developed countries, despite the fact that their average income is much less. See Table 4.

Table 4: Text and Internet Access Pricing: Asia-Pacific

Country Classification	Local SMS Message	Dial-Up Internet (30 hours/month)
Lower Income	$.03	$43.31
Upper Income	.06	37.75
Developed	.11	24.08

Derived from ITU, *Asia-Pacific Telecommunications Indicators 2002*.

Where competition in wireless has been introduced, in general, the growth rates are much higher than where there is one monopoly wireless operator. For example, most of the countries with a high percentage of wireless lines in Asia have wireless competition, while most with very low percentage of wireless lines do not. See Table 4. Note that the list of countries with high

wireless penetration includes some very poor countries, such as Cambodia, Bangladesh, and Sri Lanka.

Table 5: Mobile in Selected Lower Income Asia-Pacific Countries

	Percentage of all Lines		
Highest		**Lowest**	
Cambodia	87.0%	Tonga	2.1%
Philippines	77.9	Myanmar (Burma)	4.5
Malaysia	61.6	Vanuatu	4.9
Mongolia	61.1	Nepal	5.5
Thailand	55.5	Solomon Is.	13.0
Bangladesh	47.9	India	14.3
Indonesia	47.5	Papua New Guinea	14.7
Fiji	46.7	India	14.3
Sri Lanka	44.6	Iran	16.1
China	44.5		

(Derived from ITU, *Asia-Pacific Telecommunications Indicators 2002*.)

Conversely, the *lack* of competition appears to be the greatest barrier to providing broadband services – either through wireline technologies or through competing terrestrial wireless or satellite technologies. The following are several policies and strategies that could foster competition in broadband services.

3.2. Demand may be Much Greater than Assumed.

In designing networks and projecting revenues, planners often assume that there is little demand for telecommunications in developing regions, particularly in rural areas. Similarly, telecommunications service providers may be reluctant to extend services to poorer populations who are assumed to have insufficient demand to cover the cost of providing the facilities and services. Their forecasts are typically based solely on the lower population densities than are found in urban areas, coupled with a "one size fits all" fallacy that assumes all rural residents are likely to have lower incomes and therefore lower demand for telecommunications than urban residents. However, A study for the World Bank estimates that rural users in developing countries are able collectively to pay 1 to 1.5 percent of their gross *community* income for telecommunications services.[2] The ITU uses an estimate of 5 percent of *household* income as an affordability threshold.[3]

The take-up of wireless services in many developing countries has also demonstrated that there is significant pent-up demand for telecommunications services, even among relatively low income users. While demand for broadband is likely to be more limited, it is certainly not negligible. For example, entrepreneurs may want Internet access to order parts and supplies, check on international prices, and arrange transport of their produce to foreign markets. There may also be significant demand from government agencies and NGOs operating in rural areas to administer health care services, schools, other social services, and development projects.

3.3. Old Distinctions may no longer be Relevant.

Classifications and distinctions which once were useful may no longer be relevant. Regulators typically issue separate licenses and approve separate tariff structures for fixed and mobile services, yet these distinctions have become blurred. Mobile telephone service was designed for communication while in vehicles; however, modern cellular and PCS systems are used for personal communications, and can often be considered a substitute for fixed network connections. As noted above, in many developing countries, wireless has become the first and only service for many customers who never before had access to a telephone. Eliminating these licensing distinctions may accelerate access.

The distinction between voice and data no longer makes sense; bits are bits, and can be used to transmit anything. Yet in many developing countries, voice communication is still considered a monopoly service. Since broadband wireline services such as DSL and ISDN use existing wireline networks, a voice monopoly may actually preclude other operators from adopting these technologies. However, some countries are encouraging the growth of voice over IP, which could also be offered over broadband networks. For example, China's operators are building parallel IP networks that users can access with a prepaid phone card.

3.4. Long Periods of Exclusivity do not serve the Public Interest.

In a liberalized environment, the length and terms of operator licenses can impact the pace of growth of networks and services. Regulators typically face choices concerning how long to protect incumbents to enable them to prepare for competition, and how long to grant periods of exclusivity or other concessions to new operators to minimize investment risk. Yet exclusivity and long time periods may be the wrong variables to focus on if the goal is to increase availability and affordability of telecommunications services. Instead, investors cite a transparent regulatory environment with a "level playing field" for all competitors and enforcement of the rules as key to their assessment of risk.

A few countries have granted fixed licenses with as much as 25 years of exclusivity, although 10 years or less seems more common. Even 5 to 10 years seems like a lifetime given the rapid pace of technological change, with Internet time measured in dog years (seven to a calendar year). It is highly unlikely that fixed line providers will have an incentive to roll out broadband services beyond large businesses and some upscale residential areas if they see no near term threat to their monopoly. Some jurisdictions[4] have negotiated terminations of exclusivity periods with monopoly operators in order to enable their economies to benefit from competition in the telecommunications sector.

3.5. Resale is an Effective Means to increase Access.

Authorization of resale of local as well as long distance and other services can create incentives to meet pent-up demand even if network competition has not yet been introduced. Franchised payphones can be introduced in developing countries in order to involve entrepreneurs where the operator has not yet been privatized and/or liberalized. Indonesia's franchised call

offices known as Wartels (Warung Telekomunikasi), operated by small entrepreneurs, generate more than $9,000 per line, about 10 times more than Telkom's average revenue per line.[5] In Bangladesh, Grameen Phone has rented cellphones to rural women who provide portable payphone service on foot or bicycle to their communities. Franchised telephone booths operate in several African countries; in Senegal, private phone shops average four times the revenue of those operated by the national carrier.[6]

Resale of network services can also reduce prices to customers. Most interexchange carriers in industrialized countries are actually resellers that lease capacity in bulk from facilities-based providers and repackage for individual and business customers, offering discounts based on calling volume, communities of interest, time of day and other calling variables. Similar strategies can be used to resell broadband when networks that are upgradeable (such as for DSL) or that have excess capacity (such as optical fiber or satellites) are available.

3.6. Legalizing Bypass

Strategies to extend broadband often focus too much on technology. For example, a VSAT may be an ideal solution to bring high speed Internet access to a rural school or telecenter, but is it legal in the country in question to install the VSAT, which bypasses the public switched network? (Even if the wireline provider does not provide broadband services in the area, or possibly does not even serve the area, in some countries, such as VSAT connection would be considered illegal bypass.)

Many monopoly operators claim that bypassing their networks effectively siphons off revenues that they need to expand their networks, which would also probably create more jobs. However, the relationship is not so simple. As noted above, without competition, there is likely to be little incentive to roll out broadband, to choose the most cost-effective technologies where broadband is deployed, and to price broadband services reasonably. Thus, policy makers will not further the goal of extending access to affordable broadband by preserving wireline monopolies.

Protecting dominant carriers may also hinder economic growth. For example, a West African internet service provider pointed out that he needed relatively inexpensive international connection to the Internet in order to provide affordable Internet access for his customers. By using bypass, he is creating new jobs in value-added services as an Internet provider, as well as providing an important information resource for economic development of the country.[7]

4. Policies and Strategies for Universal Access

4.1. Universal Access Goals must be Moving Targets.

The concept of universal access continues to evolve, both in terms of services that should be universally included and in our understanding of access, which includes *availability, affordability* and *reliability.* Universal access should therefore be considered a dynamic concept with a set of moving targets. Thus, for example a multi-tiered definition of access could be proposed, identifying requirements within households, within communities and for education and social service providers.

In developing regions, the need for services besides basic voice is now spreading beyond urban areas, businesses and organizations, to small entrepreneurs, NGOs (nongovernmental organizations) and students, driven by demand for access to e-mail and the Internet. E-mail is growing in popularity because it is much faster than the postal service and cheaper than facsimile transmission or telephone calls. Such services can be valuable even for illiterates. A Member of Parliament from Uganda stated that his father sent many telegrams during his lifetime, but could neither read nor write. Local scribes wrote down his messages and read them to him. Similarly, "information brokers" ranging from librarians to telecenter staff can help people with limited education to send and access electronic information. Telecenters equipped with personal computers linked to the Internet enable artisans, farmers and other small entrepreneurs to set up shop in the global marketplace. Many countries are extending public access to the Internet through telecenters, libraries, post offices, and kiosks.[8]

4.2. If Subsidies are Needed, They must be Targeted.

The traditional means of ensuring provision of service to unprofitable areas or customers has been through cross subsidies, such as from international or interexchange to local services. However, in a competitive environment, new entrants cannot survive if their competitors are subsidized. Therefore, if subsidies are required, they must be made explicit and targeted at specific classes of customers or locations such as:

- **High Cost Areas:** Carriers may be subsidized to serve locations that are isolated and/or have very low population density so that they are significantly more expensive to serve than other locations. This approach is used in the U.S. and has recently been mandated in Canada.

- **Specific User Groups:** Subsidies may target important development sectors such as education and health through access to schools and health centers, and/or to publicly accessible facilities such as libraries and post offices. For example, South Africa plans to provide Internet access to government information and electronic commerce services through post offices. The U.S. provides discounted Internet access to schools, libraries, and rural health centers (see below).

4.3. Incentive-based Subsidies

A policy of providing discounts or other funding to end users may be more effective as an incentive to provide broadband services rather than the more traditional policy of subsidizing the carrier of last resort. One approach may be to provide "broadband vouchers" for use in low income and/or sparsely populated areas.[9] A variation of this model has been successfully used in the U.S., where schools, libraries and rural health centers are empowered through the E-rate subsidy established by the Telecommunications Act of 1996 to solicit bids for services from operators. The Telecommunications Act mandated policies designed to foster access to Aadvanced services@ for schools, libraries, and rural health care facilities through a Universal Service Fund (USF). The USF was originally established to make local telephone service available to all Americans at reasonable rates; the definition of universal service was expanded by

the Act, so that subsidies of up to 90 percent are available for school and library access, while rural health care centers may obtain subsidies to reduce their telecommunications charges to comparable urban rates.

To apply for the subsidy, each school district must first prepare a technology plan stating how it will use, manage, and pay for the facilities being requested. The State of Alaska, with more than 200 isolated villages, has been a major beneficiary of this so-called E-rate program. The state government has set up an office to assist schools with their applications. Some telephone companies have also helped the schools to apply for the E-rate program. One company has set up a project office and website for schools, and offers a package of services including connectivity via leased line or VSAT, an onsite school server, and services including e-mail, web access and technical support.[10] It views the E-rate initiative as a win-win opportunity for both schools and the telephone company, and recently has been asked to provide its package of services to schools in other states. Local telephone cooperatives have also partnered with schools and libraries to obtain discounted Internet access.[11]

An important features of the E-rate program is that the subsidy goes to the school (or library or rural health center) and not the phone company. The school is then able to post its requirements on a website and take bids for services. This encourages incumbent and new service providers to extend their services, and provides "anchor tenants" in rural or disadvantaged communities. And it empowers the schools, rather than leaving them begging for service.

4.4. Extending Access in the Community

Internet access for community institutions may still leave residents without access from their homes or businesses. One solution is for the community access point, such as a telecenter, to become an ISP. The telecenter in Timbuktu, Mali, became an ISP to serve NGOs, entrepreneurs, and local government agencies that could afford a computer and access charges. In Alaska, the FCC has issued a waiver to allow the E-rate subsidized Internet service for schools to be accessible to the community. To qualify, the community must have no local ISP and no local access to an ISP (i.e. access without long distance toll charges).[12] This approach could be a model for other rural and developing regions where commercial ISP services are not available.

4.5. Reducing Local Barriers

In some jurisdictions, local governments may inhibit broadband build out by making it difficult for operators to secure permits for rights of way or use of existing poles or conduits, or by charging fees for such permits or other services that place a significant financial burden on the operator. While such fees may be attractive sources of income for the local government, they may have the effect of delaying access to the Internet for its residents. The economic benefits of having available and affordable access are likely to outweigh substantially the value of the fees.

In the U.S., the FCC and some states such as Michigan are working to reduce local barriers in order to facilitate buildout of broadband networks.[13] Michigan's plan calls for a 45-day turnaround to process rights of way permits and eliminates redundant charges if a provider wants to offer more than one service on its lines, such as cable Internet access as well as cable video.[14]

4.6. Leading by Example

Public sector projects can also spur the installation and utilization of broadband. Applications ranging from online government services (e-government) to distance education, telemedicine and lotteries create demand for broadband services. Some governments have installed their own private networks; in these cases, it may be possible to negotiate access for other users. However, a more sustainable approach is procurement of capacity from commercial operators. In such cases, the public sector users serve as anchor tenants, providing a source of ongoing demand in communities. The connection to the communities may then be extended to other customers.

The Korea Cyber 21 project (1999-2002) involved a National Knowledge Management Project which digitized data in 5 fields: education, history, science & technology, culture, and telecommunication. A combination of such initiatives and a policy of open competition designed to spur broadband access and services has resulted in South Korea having the world's highest penetration rate of broadband of 50.4 per 100 inhabitants or 8. 5 million households as of April 2002. Several other countries have introduced initiatives to spur investment in broadband, such as Singapore, Canada and Japan.

5. Conclusion: Getting to Broadband

Despite the lag in take-up of broadband services in some industrialized countries, the demand for broadband is likely to grow, with increased reliance on the Internet for information, commerce, and entertainment, and with the introduction of online multimedia content. South Korea's penetration rate of more than 50% of the population indicates where broadband access is headed if infrastructure is available and pricing is affordable. The above lessons from the wireless experience and from the expansion of telecommunications networks in general should help to unlock the potential of broadband for rural and developing regions.

REFERENCES

Cronin, Francis J., Edwin B. Parker, Elisabeth K. Colleran, and Mark A. Gold. "Telecommunications Infrastructure and Economic Development." *Telecommunications Policy*, Vol. 17, No. 6, August, 1993b, pp. 415-430.

Garretson, Cara, "Broadband Group wants Unified Rights of Way Plan." *Infoworld*, May 30, 2002.

Hudson, Heather E. "Converging Technologies and Changing Realities: Toward Universal Access to Telecommunications in the Developing World." *Telecom Reform: Principles, Policies, and Regulatory Practices*. Lyngby, Denmark: Technical University of Denmark, 1997.

Hudson, Heather E. *Global Connections: International Telecommunications Infrastructure and Policy*. New York: Wiley, 1997.

Hudson, Heather E. "Telecentre Evaluation: Issues and Strategies." *Telecentres: Case Studies and Key Issues*, ed. Colin Latchem and David Walker. Commonwealth of Learning: Vancouver, Canada, 2001.

International Telecommunication Union. *Challenges to the Network: Internet for Development*. ITU: Geneva, October 1999.

ITU, *World Telecommunications Development Report*, 2001. www.itu.int/ti.

Jordan, Miriam. "It Takes a Cell Phone: Nokia Phone Transforms A Village in Bangladesh." *Wall Street Journal*, June 25, 1999.

Kayani, Rogati and Andrew Dymond. *Options for Rural Telecommunications Development.* Washington, DC: World Bank, 1999.

Kornbluh, Karen. "Fill Potholes on America's Info Highway", *Los Angeles Times*, June 13, 2002

McConnaughey, James W. et al. *Falling through the Net: Defining the Digital Divide.* Washington, DC: National Telecommunications And Information Administration, 1999.

Parker, Edwin B. and Heather E. Hudson. *Electronic Byways: State Policies for Rural Development through Telecommunications*, second edition. Washington, DC: Aspen Institute, 1995.

Petzinger, Jr., Thomas. "Monique Maddy uses Wireless Pay Phones to Battle Poverty." *Wall Street Journal*, September 25, 1998, p. B1.

Rusten, Eric and Heather E. Hudson. "Infrastructure: Hardware, Software, and Connectivity." *Technologies for Education: Potentials, Parameters and Prospects*, ed. Wadi D. Haddad and Alexandra Drexler. Paris: Unesco, 2002.

Telecommunications Act of 1996. United States Congress. Public Law 104-104, February 8, 1996.

U.S. Department of Commerce. *Digital Economy 2000*. Washington, DC: Department of Commerce, June 2000.

World Information Technology and Services Alliance. *Digital Planet: The Global Information Economy*. Washington, DC: WITSA, 1998.

Yoon, Beong-Yam. "Socio-Economic Effects and Policy Issues: Korea Broadband Internet." OECD Broadband Workshop, Seoul, June 2002.

Websites:

Alaska State Telecommunications Policies: http://www.gov.state.ak.us/ltgov/TIC/tichome.html
Alaska E-Rate Waiver: http://www.library.state.ak.us/usf/waiver.cfm
Federal Communications Commission: www.fcc.gov/broadband
General Communications Inc. (GCI) Schools Access: www.schoolaccess.net/
InfoDev: www.infodev.org
International Development Research Centre: www.idrc.ca
International Telecommunication Union: www.itu.int
Link Michigan: www.linkmichigan.michigan.org
National Telecommunications and Information Administration: www.ntia.doc.gov

NOTES

[1] ITU, *World Telecommunication Development Report*, Geneva, 1998, p. 50.

[2] Kayani, Rogati and Andrew Dymond. *Options for Rural Telecommunications Development.* Washington, DC: World Bank, 1999, p. xviii.

[3] ITU, *World Telecommunication Development Report*, 1998, p. 35.

[4] For example, Hong Kong, Singapore and India.

[5] ITU, *World Telecommunication Development Report*, 1998, p. 77.

[6] ITU, *World Telecommunication Development Report*, 1998, pp. 77-78.

[7] Personal communication, July 1997.

[8] Petzinger, Jr., Thomas. "Monique Maddy uses Wireless Pay Phones to Battle Poverty." *Wall Street Journal*, September 25, 1998, p. B1.

[9] Karen Kornbluh, "Fill Potholes on America's Info Highway", *Los Angeles Times*, June 13, 2002

[10]. See http://www.schoolaccess.net/

[11]. See, for example, www.mta-telco.com (Matanuska Telephone Cooperative)

[12] See http://www.library.state.ak.us/usf/waiver.cfm

[13] See www.fcc.gov/broadband.

[14] Garretson, Cara, "Broadband group wants unified rights of way plan." *Infoworld*, May 30, 2002. See also www.linkmichigan.michigan.org.