

Chapter 4

Growth in Access and Convergence toward the Internet

In 2006, Professor Muhammad Yunus, the founder of Grameen Bank, was awarded the Nobel Peace prize for his pioneering of micro-finance for development in some of the world's poorest communities. Early in 2003, Professor Yunus, referring to improving opportunities for women in poor rural regions stated:

“The quickest way to get out of poverty right now is to have one mobile telephone, and you will see how quickly she is changing her life. Come back in two years and you will not recognise what she was before.”

In February 2007, Professor Yunus said he aimed to train young rural women to be Internet service providers operating from cyber-kiosks. In the same month, GrameenPhone announced it had signed a deal with Ericsson to build and integrate a complete Internet Protocol (IP) mobile backbone network across Bangladesh. Ericsson said this marked GrameenPhone's first step towards an all-IP network. In the first stage of this development in 2006, GrameenPhone set up 500 village Internet access points which they call community information centres. The centres have a computer and other information technology (IT) equipment (e.g. printer, scanner, webcam). Internet connectivity is currently provided via GrameenPhone's mobile phone network at a speed of 128 kbps.

Internet access via wireless devices is already pervasive in some OECD countries. In Japan, for example, the number of users accessing the Internet via cellular phones or personal digital assistants (PDAs) now exceeds those using fixed computers. In Korea, almost 90% of people between the ages of 12 and 19 access the Internet using a wireless device - the highest for any age group. It is suggested that in some countries the use of computers is declining among young people due to greater use of mobile phones for Internet access.

Of course, devices such as computers or mobile phones usually have different capabilities and some content and services, created with fixed access users in mind, are often not readily accessible by cellular phone users. In addition, the pricing of data services over cellular networks has historically been much higher than fixed networks, making comparisons between the two reliant on qualifications. However, competition is driving developments in pricing and service access in this respect. In Japan and Korea, for example, inexpensive Internet access and multimedia services are taken for granted. Content is also increasingly being tailored to mobile users by service suppliers beyond the “walled gardens” which have typified mobile Internet access in the past.¹

In some countries the walled gardens approach is starting to break down. In the United Kingdom, “Hutchison 3” regards itself as a mobile media

company that offers a convergence of communications, entertainment and information services. Hutchison's 3G service enables users to have unlimited access to the Internet for a flat rate price for its own content, the content of other service providers and a user's own content.² Users of this service can access the World Wide Web (*e.g.* BBC, Amazon) as well as services tailored to their device (*e.g.* Yahoo, Ebay, Microsoft Messenger). In addition, the mobile phone becomes a networking device enabling users to access the content on their own computer (via Orb) or their television service (via a Slingbox). The service also provides users with Skype, which enables them to make unlimited telephone calls to other Skype users.

Internet access via cellular phones is also developing apace outside the OECD area. In the Philippines, access to Internet services such as e-mail, news and information, via GPRS (General Packet Radio Service), is available for USD 0.21 per 30 minutes. For 3G users in the Philippines, high-speed Internet access, live television and so forth is available for USD 0.31 per 30 minutes. In Nigeria, one of the country's largest CDMA 3G Mobile networks offers Internet access priced on a per minute basis (USD 0.06 per minute during peak time and USD 0.04 per minute during off-peak).³ This service costs a USD 7.80 one-off activation fee payment.

While metered prices for Internet access via 3G networks in developing countries tend to be relatively high for low-income users they do allow the purchase of small quantities of time from resellers. Moreover competition can be expected to reduce prices over time. In India, for example, BSNL launched unlimited Internet access using their CDMA 2000 1X network (at speeds up to 144 kbps) with a fixed monthly charge of USD 5.85. The company had earlier trialled the offer in rural areas of India. Shared use and resale of such an offer makes an already inexpensive option even more affordable.

The use of fixed wireless options is also increasing in developing countries and can be particularly useful in areas not covered by fixed networks or cellular networks. To date, prices for pre-WiMax and WiMax systems, for individual use, tend to be relatively expensive. In the context of linking communities for shared use or offering the opportunities for resale such pricing can, however, be affordable. In Namibia, MWEB offers a WiMax access service for USD 70 per month. Internet Ghana offers a similar service called Skyburst for USD 81 per month. Fixed wireless networks are also being rolled out in India. BSNL, for example is planning to add 1 000 WiMax towers by the middle of 2008 which would cover as many as 20 000 to 30 000 villages.

Further research and development in respect to fixed wireless for rural areas as well as an increasingly competitive market for equipment

manufacturers can also be expected to drive capabilities. Intel, for example, is collaborating with Universities in California and Russia to develop a low-cost antenna that can transmit and receive Wi-Fi signals over distances as far as 100 kilometres. Researchers are also turning their attention to how to scale wireless networks to cope with a large increase in devices connected to the Internet. At Stanford University this includes researching ways to give wireless devices the flexibility to find and access unused spectrum when they need it.

Prior to direct wireless or fixed access being available in rural areas, entrepreneurs in developing countries have sometimes introduced interim solutions. Just as the “pony express” once provided a bridge between geographically separate telegraph lines, suitably equipped buses now carry cached e-mail and web-content for villages without direct access. One such initiative, United Villages, say their technology brings Internet access to about 110 000 people living in rural areas of India, Cambodia, Rwanda, Costa Rica and Paraguay. Under this programme computer kiosks are set up in each village for users to compose e-mails, conduct web searches, read the news, access voicemail, buy products from online stores, send SMS and so forth even if they do not have a mobile phone. Wi-Fi equipped buses visit the villages up to six times a day, automatically collecting requests from the computers and physically transporting the data to the nearest direct Internet connection. Users pay for the service through prepaid cards, which they can buy from the kiosk in their village providing a self employment opportunity for the vendor.

Terminal equipment and Internet access

Wireless operators and Internet Service Providers (ISPs) in developing countries are also marketing less expensive devices. The GSM Association (GSMA) has a goal of making terminals increasingly affordable to users in developing countries.⁴ In 2005 they announced a price point of under USD 30 had been reached at the wholesale level. This is part of the GSMA’s Emerging Market Handset Program for handsets priced below USD 30 to USD 40. Furthermore the GSMA’s “3G For All” programme aims to bring 3G multimedia services and mobile Internet access to a mass-market user base around the world through more affordable handsets. The GSMA also points to the role refurbished handsets can play in developing countries by way of providing affordable options. In 2006 they estimated 1 in 10 phones purchased, in that year, was a ‘used phone’.

Code division multiple access (CDMA) handsets with Internet capabilities are also increasingly affordable. The CDMA Development Group (CDG) reports that CDMA2000 1X handsets are available in many

markets for less than USD 50. In India they note prices differ by as little as USD 4 for second generation handsets. The CDMA Development Group further reports that Korean manufacturers are aiming at producing USD 30 handsets in 2007 and USD 20 handsets by 2008. A CDMA2000 1X can deliver Internet data at 153 kbps at peak performance or between 60 to 100 kbps in commercial service. Higher performance is being introduced, in a growing number of markets, with the next generations of CDMA technology.

The wireless industry is also expanding into portable devices with larger screens, keyboards and so forth. In Ghana and Kenya operators have launched services with OGO devices. The aim is to repeat the success enjoyed by BlackBerry and Smartphone, with inexpensive terminals and services aimed at young adults and those with lower incomes. The offering in Ghana includes the following services: MSN Instant Messaging, e-mail, contact book, calendar, web browser, GSM voice, and SMS. Such services, using OGO handsets, are already available in Germany, Switzerland, Turkey and the United States. The Turkish operator Telsim, for example, offers “free terminals” with a 12-month contract and unlimited data plans for around USD 15 per month. In Uruguay, Ancel’s prepaid users purchase OGO terminals for USD 70 and pay around USD 7 per month for unlimited data access.

The growing availability of wireless Internet access may be the reason that local surveys are beginning to find higher levels of Internet use than expected. In late 2006, a survey commissioned by CCK, found 2.9 million Internet users or roughly 9.3% of the total population in Kenya. This was almost double the previous best available estimate of the level of Internet use. Between 2002 and 2006, the ITU reports that the number of economies with broadband mobile services grew from 2 to 79.

In community settings, educational institutions and Internet cafes larger and more affordable devices will also be increasingly available. Perhaps the best known initiative is the so called USD 100 laptop launched by faculty members at the MIT Media Lab. Based on this initiative the One Laptop per Child (OLPC) is a non-profit association dedicated to research to find a technology that could make such devices increasingly affordable in educational settings. The private sector is also increasingly involved in such areas. In March 2007, Intel Corporation launched a PC platform that has been developed exclusively to meet the needs of rural villages and communities in India. Intel aims for its “Jaagruti” programme to support the spread of rural Internet “kiosks” with community computers. The new platform is designed to deal with weather conditions (*e.g.* heat, dust, humidity) and unreliable power sources which can compromise typical computers used in such environments. For its part, Microsoft has announced

it will sell software for USD 3 in an effort to bring the benefits of ICTs to the next several billion users.

Developing content for a wireless environment

Expanding access and affordability are critical components in taking advantage of the convergence between various platforms and the Internet. When users are empowered by complementary skills (*e.g.* education), to take advantage of opportunities the Internet creates, this can be a powerful force for economic and social development. Information, when it is applicable to user's needs and tailored to be accessible over the platforms they use, is fundamental to this process. From the two, relevance is likely to be the larger, though far from insurmountable, challenge. Major content and service providers are increasingly devoting greater resources to tailoring their products to the dimensions of handheld devices. New information management tools such as browsers specifically designed for handheld devices, with graphical instead of text interfaces, GPS Widgets linked to local information and voice commands are all increasingly available.⁵ As these technologies develop, they enable opportunities for local developers to create relevant content and services that can be more accessible to users with lower literacy rates.

The .mobi domain encourages content and service providers to develop to content formatted for handheld devices. An example of a site, providing local information in India, is eindia.mobi. The company responsible for the .mobi domain has made a tool available at <http://ready.mobi> which enables users to enter an address, such as www.oecd.org, and see how the website would be treated by a hand held device. This includes whether the content will be displayed, the time to download the content via Wi-Fi, 3G and GPRS as well as an estimated cost per page for users in Australia, Latin America, China, Europe and the United States. While it is not necessary to use .mobi to format a website for a handheld device, the tool nicely illustrates the expense incurred to mobile users downloading web pages not formatted with hand held devices in mind. This is something that providers targeting the poor with information on health, education and so forth will need to bear in mind.

The services some users access are among the most popular on the Internet. Subscribers to Onetouch's OGO service in Ghana, for example, can download e-mail from Gmail and Hotmail or access news sites such as the BBC and CNN. If, however, the tools are made available along with the skills to take advantage of them, local content and services will be developed including those which produce revenue opportunities. In Kenya, young computer programmers have produced African themed adventure

video games. The games can be purchased and downloaded online. In Ghana software engineers have developed code as part of the Semapedia project which aims to connect real objects with online data at Wikipedia. In Accra prominent landmarks have Semapedia tags which allow mobile users to call up related Wikipedia content. This creates a market opportunity whereby tourists can call up information over their mobile phones.

Content must also be relevant to the poor as users. Research from the first decade of Internet use in developing countries demonstrates that access is not sufficient if the information is not applicable or useful. In Uganda, research published in 2003, showed rural Internet Kiosks were under-utilised by farmers as the relevant pricing information from local markets was not available and that other potentially relevant content was not available in local languages. More recently efforts have endeavoured to integrate ICT more broadly. The creation of commodity exchanges in developing countries which use ICTs to improve the availability of relevant local market information and connect buyers and sellers and reduce transaction costs are a leading example.⁶

In some areas, such as education and health, governments have a clear requirement to provide locally relevant content. That being said the Internet also provides micro-revenue opportunities for content creation. Cyber cafe owners in developing countries, for example, are beginning to compliment their access income with advertising revenues. The barriers to participate in Google “adsense and adwords” programs, Microsoft “adCenter” or Yahoo! “Search Marketing Products”, for example, are very low on the part of advertisers and content producers. Nor should popular services, among the poor, be discounted in their ability to develop access and create sustainable markets which complement the delivery of essential services in areas such as agriculture, health and education. In India, “Bollywood” is already developing films for mobile devices and this is expected to enhance the overall profitability of the wireless market. In Nigeria a flourishing market for film making has emerged with the advent of inexpensive digital cameras and computer editing. By some measures the country is now said to have the third largest film industry in the world after the United States and India. “Nollywood” is reported to be producing 2 000 films annually with a typical cost per film of USD 10 000 to USD 40 000 and a seven-day production cycle. The films are sold on disc for a few dollars or rented for a few pennies with the target market being the consumers with low incomes.

Economics of security for a global Internet

One aspect of the Internet, as an interdependent network-of-networks, is that the economic costs of any action, which potentially impact on other networks and users, may not be taken into consideration by various actors in their own decision making. Expenditure on security is generally seen as a cost. Network owners and users are primarily motivated by the need to protect their own economic and social interests and, to the extent they internalise costs, the overall health of the Internet.

When operators and users do not internalise costs they are potentially passed to other networks and users. For example, if a user's computer becomes compromised by a "botnet" that Internet connection may then be used to launch attacks on other users. The owner of the infected host may be little impacted and may be unaware of any such infection. Indeed, it can be in the "bot herder's" interest to minimise the likelihood of detection and impact on the host's own computer and connection. The challenges in this respect are being considered in the OECD's work on the economics of malware and need not be repeated here. Notwithstanding this, all stakeholders need to consider the impact the economics of malware could have as the next several billion users join the Internet.

In Europe there is some evidence that in lower-income regions there is less use of security measures such as anti-virus software. In comparison to developing countries these areas are, of course, relatively wealthy. For low-income users communications access can form a significant part of their total household income. They need to be convinced that this expenditure is in their interest before they will join a network and, once they have done so, actively employ strategies to minimise their costs. This is economically rational behaviour on their part. Like their counterparts in developed countries, low-income users in developing countries may not consider the economic impact on other users if they bear the cost of security but do not see direct benefits to themselves.

The purveyors of malware tend to "follow the money" in terms of the primary targets of their activities. Denial of service attacks, for example, are more likely to be targeted against those with a greater propensity to pay or be politically motivated. To be sure, users in developing countries can be impacted negatively by non-discriminatory attacks such as spam and viruses and their resources (*e.g.* bandwidth) can be abused by such attacks. They may, therefore, see social and economic benefits in taking preventative measures. That being said, it is necessary to recognise that, their propensity to pay for security will be far less than their counterparts in the developed world.

In India the average revenue per Internet subscriber, including dial-up and broadband is around USD 60 per annum. An “always-on” DSL connection at between 256 kbps to 2 Mbps can be had for a similar price in India.⁷ By way of contrast a similar connection in an OECD country can cost in the order of USD 360 per annum. To protect their connection to the Internet with a basic product, from a leading security vendor in an OECD country, it can cost a user in the order of USD 80 per annum. Accordingly, in the OECD area, this represents an additional 22% cost to users whereas in India it would represent a potential additional 133% cost to users. For users in developing countries, with metered Internet access service (*e.g.* with low bit caps), regular updates may also impose an additional cost.

This raises a challenging issue in terms of expanding the benefits of the Internet to the next several billion Internet users. Will solutions emerge from the market in an area where expenditure may be regarded by users as a cost rather than, as is the case for access, an opportunity for their own economic and social well being? Certainly there are some “freeware” firewall and anti-virus products available that afford basic protection. Freeware may not, however, be available in local languages or have the technical support which accompanies purchased products. On the other hand the development of technology for low-income users throws up opportunities for innovation. The One Laptop per Child initiative is working to incorporate security measures into the design of the inexpensive laptops that are aimed at preventing theft or resale as well as protection against malware. Some experts suggest that security innovations developed in such a challenging environment may find their way back to the computing environments in OECD countries. An example highlighted is that the developer of the OLPC is trading compatibility with legacy applications in favour of stronger security.

Notes

1. A “walled garden”, in this context, refers to whether users can access content and services from any source, such as the open Internet, or are limited to content and services provided by a mobile operator and its partners.
2. The prices are USD 10 or USD 20 per month, over and above the regular subscription, depending on the package chosen.
3. This service costs a USD 7.80 one-off activation fee payment.
4. The *Groupe Speciale Mobile* (GSM) Association was formed in 1987.
5. For example: <http://zenzui.com/> and www.where.com/ and www.tellme.com/.
6. For example in India and Ethiopia.
7. For example, BSNL prices are at www.bsnl.co.in/newsdetailed.php?news_id=352.

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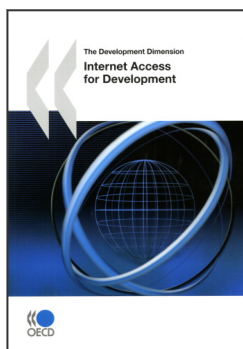
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