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**PROMOTING BROADBAND:
BACKGROUND PAPER**

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This paper has been prepared for the ITU New Initiatives Workshop on Promoting Broadband, in April 2003, in Geneva. The background paper was prepared by Taylor Reynolds (taylor.reynolds@itu.int) and Gary Sacks (gasacks@dc.com), overseen by Tim Kelly (tim.kelly@itu.int). The paper was edited by Joanna Goodrick (joanna.goodrick@itu.int) and thanks go to Tensin Tobgyl (tensin.tobgyl@itu.int) for her contribution. Country case studies on Promoting Broadband, including Canada, Iceland, Republic of Korea, Japan and Hong Kong, China can be found at <http://www.itu.int/broadband>. The opinions expressed in this study are those of the authors and do not necessarily reflect the views of the International Telecommunication Union or its membership. The New Initiatives programme is managed by Tim Kelly. For more information on the Programme, see the ITU website at www.itu.int/ni.

Promoting Broadband: Background Paper

Executive summary

The aim of this background paper is to examine some of the promotion techniques of broadband networks and services that have proven to be successful from both a demand and supply perspective. This should enable those interested in the promotion of broadband to identify how those techniques can apply to their own economies, and to address some of the problems faced. The paper concludes that *inter alia*, that:

To promote demand:

- It is crucial for users to be aware of the benefits that broadband can provide. Both governments and the private sector can play an active role in marketing the benefits of broadband. Successful approaches may include ensuring that broadband is available in schools, enabling consumers to share broadband connections, and permitting bundling of broadband with other services. Government promotion campaigns and co-branding can also encourage take-up.
- Users must be convinced of the advantages to be gained by adopting key broadband technologies and integrating them into their daily lives. Applications that have been meshed into successful broadband economies include IP telephony, video chat, audio over broadband and online gaming. Business and government cultures can also embrace and encourage ideas such as teleworking and online transactions. Finally, policies that encourage content development in local languages will create favourable conditions for adoption.
- Economies must offer an environment that fosters broadband development and diffusion. This includes careful consideration of intellectual property rights, support for sectors that participate in developing new, high-bandwidth applications, methods for diffusing technology, and measures to ensure security for users.
- Consumers will only adopt broadband when they can justify its cost in terms of the value it adds. A competitive market structure is therefore vital to sustain low prices. Tailored pricing plans and the elimination of large lump-sum payments can aid affordability.

To promote supply:

- Competition is the key to driving prices down and increasing the broadband options available to consumers. The most successful economies in terms of broadband penetration have strong competition both among providers of the same broadband technologies, and between providers of different broadband technologies. Furthermore open access policies can help promote service competition. It is also beneficial to have players in the market that are sufficiently large and deep-pocketed to rival the incumbent operator.
- Existing infrastructure should be utilised to the full to enable broadband rollout. But new investment is also required, and this should be future-oriented, anticipating the likely demand for ever-faster Internet connections.
- Schools, hospitals, and community access centres can act as effective anchors for broadband demand in areas where individual household connections are not yet viable. The network can then expand incrementally from these key points as the technology and economy allows. Wireless broadband also offers a viable community alternative to fixed line solutions such as broadband via DSL or cable modem.
- Governments can participate at all levels. National, regional and city-wide initiatives and community participation projects have been successful in expanding access. In some cases, governments have chosen to provide, or to subsidize, infrastructure to stimulate the economic development of a particular area.

Overall, it is clear that there is no single key to promoting broadband. Promotion strategies and policies will prove most effective when various initiatives and projects are integrated, encompassing all stakeholder groups, and adjusted to contextual and environmental factors.

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1 Introduction

1.1 Promoting broadband, and why now?

Broadband has been referred to as the infrastructure of the knowledge economy. Countries around the world have nominated broadband networks as crucial infrastructure for achieving their social, economic and scientific goals. Furthermore, broadband has been described as a panacea for a range of social and economic woes as well as a way of revitalizing demand for the products and services of the telecommunication sector.

However, in some countries the take-up of broadband has been disappointingly slow, and in many economies around the world it remains below expectations, although there are significant exceptions, most notably the Republic of Korea. Even where infrastructure is available and the cost affordable, demand for broadband has tended to remain sluggish. It appears that end-users do not universally perceive high-speed data delivery to be the wonder it is sometimes hyped up to be. Figure 1.1 shows the penetration of broadband in the fifteen economies where adoption has been most successful. Figure 1.2 provides an indication of how well different economies are doing in broadband penetration relative to income levels.

Many Internet users appear unconvinced that the benefits of broadband are worth its additional cost. The most successful Internet applications—e-mail and instant messaging—offer users almost the same experience whether on a 56 kbit/s¹ dial-up modem or on a 1.5 Mbit/s broadband connection. Yet even if broadband were free, one could not expect to see 100 per cent usage immediately, even where it is readily available. This is highlighted by an experiment conducted in the town of LaGrange, Georgia in the United States, whereby cable broadband access was offered for free to all interested consumers.² One year after this was first offered, only 29 per cent of residents had subscribed.³

This highlights the problem this workshop seeks to address: if governments and industry are convinced that broadband is essential to growth and development, how can they encourage users to take up the technology? This paper allows those wishing to promote broadband the opportunity to examine the broadband promotion techniques that have worked from both a demand and supply perspective, identify how those techniques can apply to their own economies, and address some of the problems faced in broadband promotion. The aim is not to promote broadband networks *per se*, but rather to promote the availability of high-speed Internet access as a platform for developing a range of new and innovative applications and services.

For the purposes of this paper, *broadband* refers simply to high-speed, high-capacity communication providing Internet access of which digital subscriber lines (DSL) and cable modems are currently the most popular technologies.

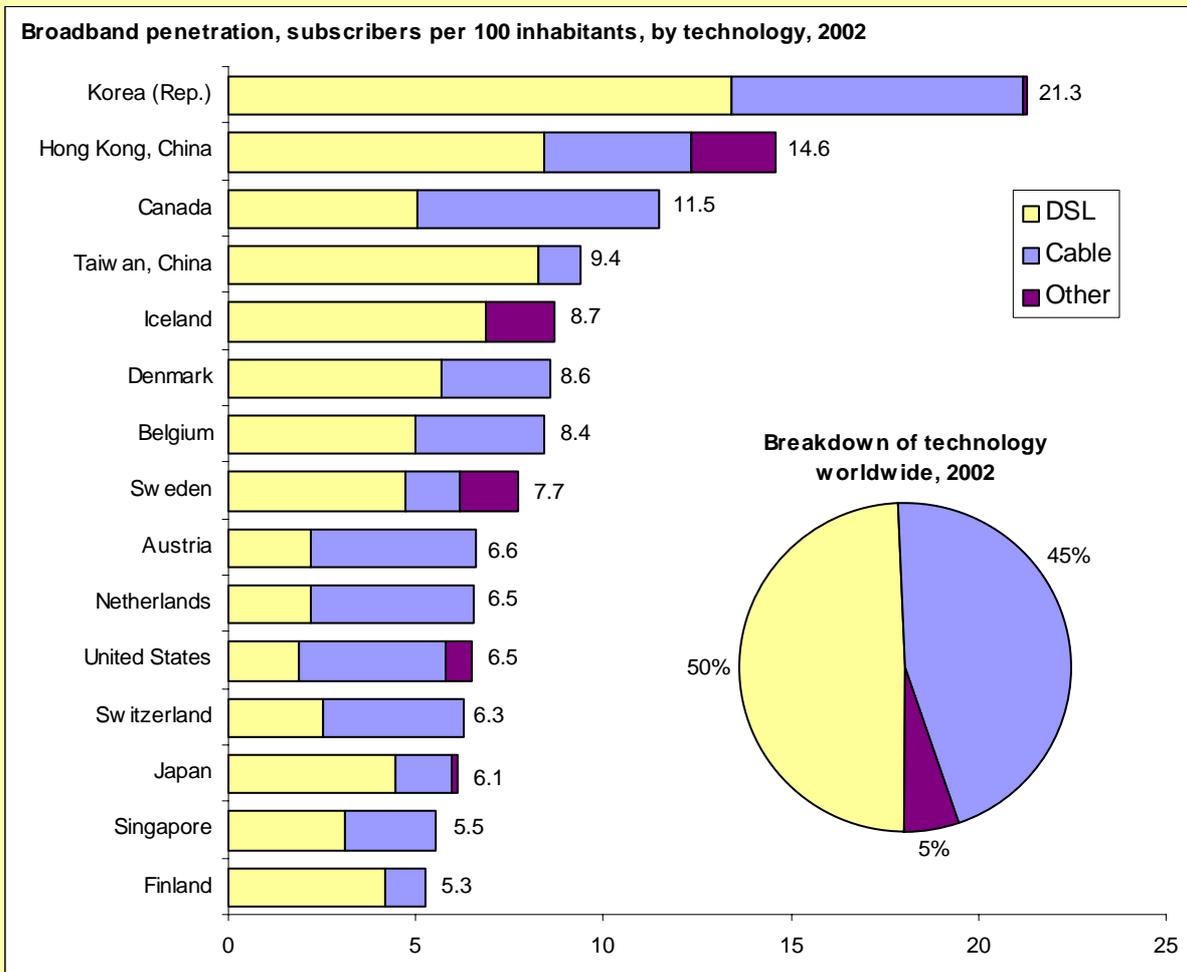
1.2 Why promote broadband?

Generally speaking, the main reasons for promoting broadband can be given as follows:

- Benefits to users. Compared with narrowband, the increased speed and always-on⁴ nature of broadband enables the exchange of richer content, facilitates improved, expanded and more rapid communication, and allows the sharing of a connection with multiple users.
- Benefits to the economy. Broadband connectivity is helping to establish an “information society”. It encourages innovation, stimulates growth in an economy, and attracts foreign investment.
- Returns on investment. Broadband holds the promise of new applications and services that will attract users and help recover infrastructure development costs.

These points are expanded on below.

Figure 1.1: Broadband penetration rates around the world
Top 15 broadband economies, worldwide



Source: ITU

Note: Data for Canada and the United States are estimates.

1.2.1 Benefits of broadband to users

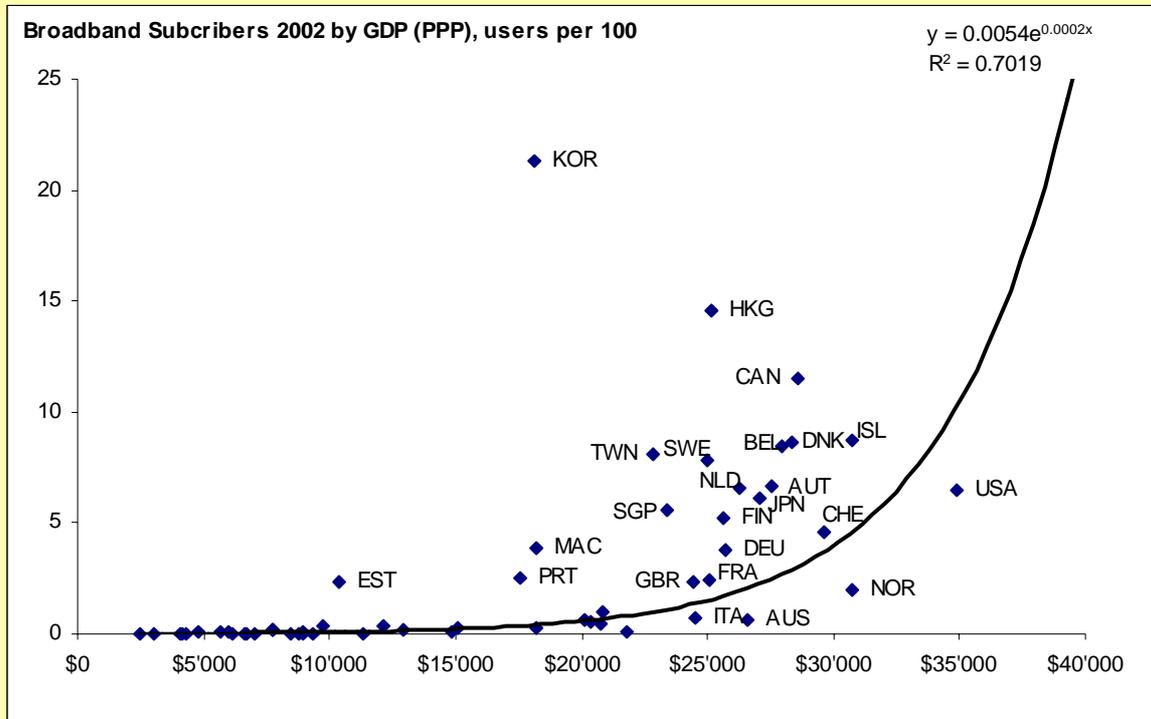
Richer content exchange

As the Internet matures and moves from being largely a luxury towards being a basic necessity, faster access to richer information becomes more important to users. Broadband allows more information to pass to the user's computer in less time than with slower connections. This increased speed can offer significant time savings and can significantly reduce frustration levels for users. This is especially true for those who download large amounts of information from the Web. Figure 1.3 (left) shows approximate download times for a 3-megabyte file over different types of Internet connections.⁵ Figure 1.3 (right) shows approximate file sizes for several popular types of files.

Broadband enables users to access and exchange high-quality graphics and other bandwidth-intensive content, such as 3D imagery in video games, that would prove either impossible or difficult to use effectively over slower connections. There are many content-rich applications that have been identified as potential drivers of broadband take-up. This ever-growing list, for which many benefits have been cited, includes applications in voice, audio, video, e-commerce, e-education, e-health, government services, online gaming, and file sharing.

Figure 1.2: Broadband Penetration and GDP

In general, countries with high levels of GDP per capita, may be expected to have more broadband connections than those with lower levels. Economies above the best-fit trend line (such as the Republic of Korea) have higher broadband adoption rates than their income would predict. Likewise, economies below the trend line (such as the United States) are struggling with broadband penetration and do not have as many connections as their peers at similar income levels.



Source: OECD and ITU data, GDP values from the World Bank.

Note: Not all values are 2002 data. If broadband data is unavailable, the most recent observation is used. GDP (PPP) figures are from 2001. Luxembourg's 0.27 penetration and \$52,963 GDP per capita (PPP) figures were used to compute the trendline but are not shown on the graph.

Improved communication

As mentioned above, communication applications such as e-mail and instant messaging have been major drivers of Internet usage. A key attribute of broadband in enhancing the effectiveness of these communication applications is that it can be offered as an always-on connection, usually priced at a rate that is independent of the time spent connected. In addition, broadband does not tie up a telephone line as a typical dial-up connection does. Thus, broadband facilitates communication through increased availability. Furthermore, the increased bandwidth offered by broadband enables the use of other communication applications, such as video-e-mails, file and photo sharing, and videoconferencing. Moreover, broadband enables higher levels of interactivity than other communication channels, thereby providing a better user experience.

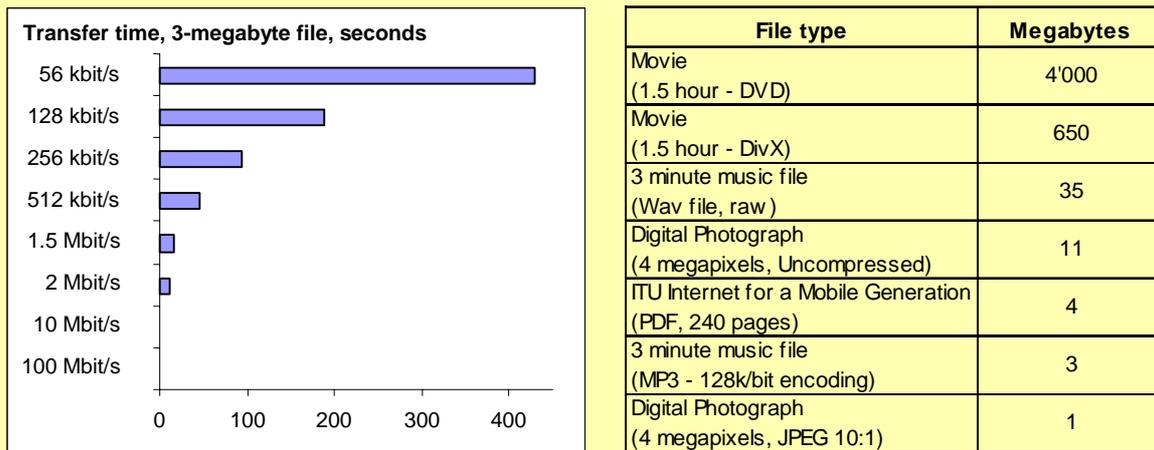
1.2.2 Benefits of broadband to the economy

For many countries, broadband forms part of the goal of establishing an information society. The idea is that people's lives will improve as they have access to better information and applications concerned with health, education, finance, and a range of other topics. For these economies, the promotion of broadband forms part of an overall plan to realise the benefits of access to information in digital form.

Additionally, many countries recognise that promoting broadband adoption encourages innovation, thereby stimulating growth within the economy. As a new technology, there is significant scope for innovation surrounding broadband as people interact with it and new applications are developed that take advantage of its characteristics.

Broadband networks can also help to attract foreign direct investment. This brings new money into the economy and serves as a conduit for transferring technological know-how.

Figure 1.3: Download time of a 3-megabyte file for various Internet connections



Note: (Left) The times listed use the theoretical maximum line speeds and do not take into account any transmission control overhead. As a rule of thumb, overhead will decrease transfer rates by around 13 per cent. Network congestion will slow transfer speeds further still.
 (Right) The digital file sizes are only approximations as things like video resolution and sound quality have an enormous impact on overall file sizes.

1.2.3 Return on investment

The last few years have seen telecommunications suppliers around the world investing considerably in broadband infrastructure. Some of the investments have been very large and now there is a strong push from governments and suppliers to begin seeing returns on their investments. On inter-city routes, especially across the Atlantic, there is considerable excess capacity for data traffic. This has forced prices down below a level at which investments can be recovered. Without investment in broadband in the access network, there will never be enough demand to use the capacity of the undersea cables. Furthermore, low returns on existing investments reduce incentives to invest in next-generation communication services. For these reasons, the promotion of broadband take-up is now of high priority.

1.3 Outline of the paper

This paper addresses broadband promotion from two angles. First, the paper introduces issues to consider, successful strategies, and ideas for promoting broadband *demand*. This is most relevant for areas in which broadband infrastructure is already in place. Second, the paper discusses issues, strategies, and ideas for promoting the *supply* of broadband. This is relevant to areas where broadband is not currently available, as well as to areas that could benefit from a wider variety of choice and lower prices for consumers. Issues for governments, regulators, telecommunications suppliers and industry in general are addressed throughout the paper.

2 Promoting broadband demand

Over and above differences in culture, landscape, and technological development, economies that have been successful in promoting broadband have several key factors in common. These four factors are first summarized below and then discussed in detail throughout the section. A successful broadband economy will be characterized by:

1. **Informing the public about broadband.** Efforts to promote demand for broadband depend largely on the target market being aware of the products available, and aware of what benefits broadband can provide them. Increased exposure to broadband should boost take-up rates. Growth should be rapid once penetration reaches a certain critical mass.
2. **Making effective use of broadband through applications and content.** Broadband adoption is much higher in countries where users make full use of current broadband applications. This may include high usage of IP telephony, video/audio via broadband, online gaming, and telecommuting. Content in local languages also plays a key role. Policies that encourage these uses should boost penetration rates.
3. **An environment that fosters broadband innovation.** Economies must have policies and incentives in place that create a fertile environment for broadband content and application development. This includes important issues such as thoughtful intellectual property protection, adequate government funding for Internet research, and consumers ready to participate in developing new, high-bandwidth applications.
4. **A competitive market structure that keeps prices low.** There is no substitute for true market competition in broadband to reduce prices. Subsidies, grants, regulatory obligations and other financial support are only temporary fixes and cannot replace a well-functioning market. Efforts to ensure the market runs efficiently will have the greatest effect on prices, and in turn on broadband adoption.

2.1 Informing the public about broadband

As mentioned above, the first element common among successful broadband economies is that potential users are well-informed about the benefits of broadband. This can be through the efforts of broadband firms, governments or other interested parties. The key element is that users know what broadband is and how it can be useful to them personally. This highlights the need for successful marketing and awareness campaigns.

The benefits of broadband are hard to appreciate until they have been experienced. Video game console manufacturers are very aware of this power of exposure to their products and have invested heavily in demonstration consoles in stores for people to try, hoping a brief experience will convince them they need a console at home. This example shows how broadband promoters can greatly benefit from finding ways to increase public exposure to broadband because, once users have “tasted” the experience of broadband, they are much more likely to want broadband access in their homes. The following sections will examine ways to increase exposure to broadband in an effort to entice more people to subscribe.

2.1.1 Schools

Schools provide an ideal environment not only to realize the educational benefits of information access but from a marketing and awareness perspective, to introduce youth to broadband. Many governments have taken the initiative by providing funding and establishing national plans to supply broadband to schools. In the UK, for example, the Government announced in November 2002 that it would provide funding for broadband connections to all schools by 2006⁶. Estonia is another country that has seen far-reaching benefits from this sort of policy (see Box 2.1).

One way that service providers have expanded access to schools is by connecting schools for free or at a reduced rate. Swisscom (a publicly traded company but with the Swiss government as majority shareholder) is offering free Internet connections for all the country’s public schools under its “Internet for Schools” initiative, and plans to have all schools connected by 2005⁷. In addition, Swisscom has launched an advertising campaign touting this program. This campaign served not only to raise general awareness of broadband, but also identified Swisscom’s name with the project in an effort to enhance the image of the company.

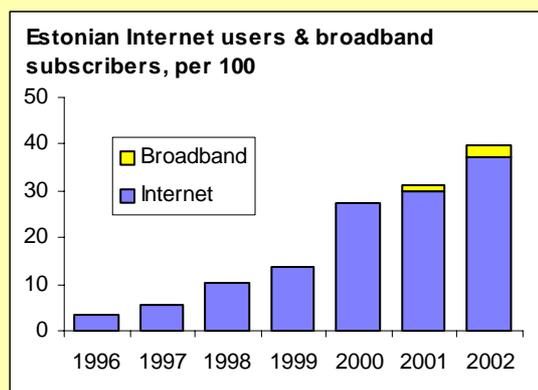
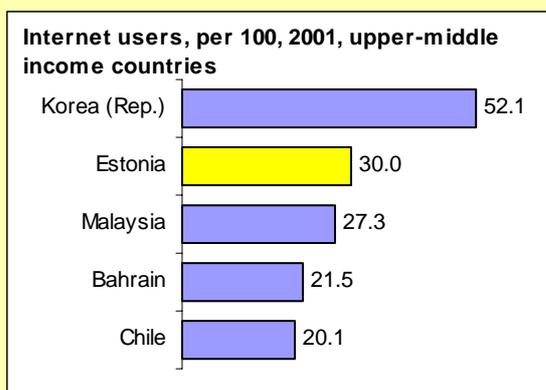
Box 2.1: Estonia: Tiger, Tiger, Burning Bright

Broadband in education: Far-reaching benefits

Estonia launched the Tiger Leap National Programme in 1996 in an effort to make a developmental leap by introducing information and communication technologies (ICTs) into secondary schools. The targets were to achieve the ratio of one PC per 20 students, an Internet connection to each school, and basic computer training for all teachers. Today, the programme has accomplished most of its goals. Through Tiger Leap, 75 per cent of all Estonian schools have broadband Internet connections and the remaining schools have a dial-up option. More than 63 per cent of teachers have received training courses, acquired basic computer skills, and have been given guidance in using contemporary ICTs in teaching.

Investment in IT education and the promotion of broadband access in Estonian schools has been a significant factor in spreading the use of ICTs more broadly, beyond the boundaries of the education system. The programme has attracted considerable backing from local governments, the private sector and international investors, and has helped to shape Estonia's progressive reputation. Today, 35 per cent of the Estonian population uses the Internet, 38 per cent uses personal computers, and 18 per cent have their own home computers. Furthermore, 90 per cent of government agencies' computers are connected to the Internet. These figures place Estonia among the leaders in usage of IT in upper-middle income countries (see graph, bottom left). Estonia's broadband penetration (at 1.70 per cent of the population in September 2002) ranks it among the world leaders.

Some six years after the introduction of Tiger Leap, a new generation of Estonians, accustomed to fast information access and equipped with ICT skills, is reaching university level. As these students grow older and continue to demand fast access to information in different areas of their lives, the demand for ICT-related competence can be expected to continue its rapid growth.



Source: (Data) International Bureau of Education (2002) <http://www.ibe.unesco.org>.
 UNDP Estonia (2002) <http://www.undp.ee/tigerleap/2.html>.
 (Graphics) ITU World Telecommunication Indicators Database.

Note: 2002 Internet user data is an estimate.

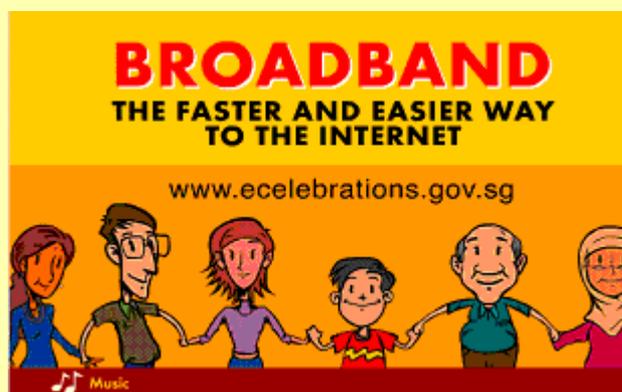
2.1.2 Government-sponsored promotion campaigns

Some governments have initiated broadband promotion campaigns similar to the types of public information campaigns that promote the use of public transport or environmental recycling programmes. These campaigns generally do not promote broadband for the benefit of one provider only; rather, they highlight applications, content, and benefits of broadband through public service announcements. An example of one such campaign that has met with successes is that developed by Singapore's government, as described in Box 2.2.

One innovative approach to increasing broadband awareness is the "Try Before You Buy" programme in Wales, UK, where Government-funded ICT business support centres showcase and demonstrate broadband connections and applications to businesses so they can try the technology before they subscribe.⁸

Box 2.2: The Singaporean Government’s broadband promotion

Singapore’s government has taken a proactive role in promoting broadband through its “e-Celebrations” campaign. Through mass media advertising, it has raised awareness of broadband and ICTs in general. The e-Celebrations campaign follows cartoon family members through their introduction and adoption of broadband and other ICTs.



The Singapore Government has also co-developed a popular broadband portal aimed at promoting broadband awareness and use. The site hosts its own multimedia content, including music and movie reviews, documentaries, and even automobile stunt driving demonstrations. In addition, the site has a categorized directory of other broadband content on the Web. Both campaigns form part of the Singapore ONE initiative, a collaborative effort between the government and industry to implement a nationwide broadband network and deliver interactive online applications and services to all Singaporeans.

Source: Singapore ONE, <http://www.singaporeone.com.sg> ; e-Celebrations <http://www.ecelebrations.gov.sg>.

2.1.3 Co-branding

While direct promotion campaigns have been very successful in several countries, others have chosen co-branding as a method of increasing broadband awareness. Co-branding is essentially tying broadband services to other products that consumers come into contact with. Co-branding can be an effective way to introduce users to broadband through companies they already use or know. This is especially important because broadband often seems daunting to non-technical users and anything that offers familiarity should help with its adoption. Box 2.3 explains how Japanese broadband providers have teamed up with cartoon characters or gaming console manufacturers.

In addition to simply offering a well-known mark, co-branding can be an excellent way to promote content. Sports teams around the world have been among the most progressive in offering these services through content tie-ups. It is becoming common for professional clubs to offer subscription services whereby they provide exclusive broadband content on their websites, such as interviews with players and match highlights.⁹ It is unclear how profitable these subscription arrangements will be in the long term, and other avenues for revenue-generation may need to be pursued. It would appear that opportunities exist for these clubs to go one step beyond content provision, perhaps partnering with ISPs to offer broadband connectivity services branded with club content. For instance, Manchester United’s sponsor is Vodafone, which hopes to be able to transmit highlights to the club’s fans across the world via 3G handsets.

Box 2.3: Promoting pipes with Peanuts, planes, and PlayStations

Cartoons have a special place in Japanese culture and broadband promoters have taken advantage of the Japanese affinity with comics to promote broadband services. Yahoo Broadband offers “Snoopy” branded services that feature the comic strip translated into Japanese, along with other Peanuts-themed content.

In addition to Peanuts content, Yahoo Japan Broadband has co-branded with Sony to offer broadband access optimised for Sony Playstation2 users. Even travellers have their own version of Yahoo Broadband through their partnership with ANA airlines. The relationship can be beneficial for all parties involved.

Source: Yahoo Broadband Japan at <http://www.yahoo.co.jp>

2.1.4 Bundling broadband

While co-branding raises broadband awareness through partnering with other businesses, bundling broadband with other similar services such as telephone or cable TV can be another effective way to promote awareness and market broadband to households. This is relatively easy with cable and DSL connections since cable TV operators and telephone companies often double-up as broadband Internet providers.

Another promising way to promote broadband is through bundling broadband hardware with new PCs. A recent trend is for computer equipment manufacturers to include broadband modems and Ethernet network interface cards as standard features in new PCs. This is already common in both Taiwan, China and the Republic of Korea. By making DSL modems standard features, consumers are encouraged to adopt broadband rather than dial-up. The implications of moves such as these for cable operators may be significant.

However, the practice of bundling does raise concerns in the context of competition policy. If a company with a dominant market position in once service or product market bundles this service with one in an emerging market in which it does not have dominance, it may be accused of unfair competition. Regulators need to monitor this activity carefully.

2.1.5 Shared connections

As broadband promoters seek to introduce ways for people to first experience broadband, one aspect that is often overlooked is the potential promotional value of allowing users to network computers together and share a broadband connection and cost. The advantage is that, by sharing a connection, the price per computer (or per user) is significantly reduced. Furthermore, if households are allowed to share connections or divide access among computers in one location, they are perhaps more likely to subscribe in the first place. Thus, promoting the ability of broadband to handle multiple users on a single connection could be a highly effective way to convince users to sign up.

Nevertheless, many broadband providers have been unwilling to allow users to share their Internet connection, some explicitly stating that it is a breach of contract to share outside of an immediate household.¹⁰ Service providers and policy-makers should consider embracing connection sharing as a method to promote broadband take-up and experimentation with broadband. The example of schools shows an initial exposure to broadband via a shared connection is likely to stimulate demand for individual access later on, especially as bandwidth needs increase.

Broadband providers can promote broadband to households by bundling routing and wireless networking equipment with their services. For instance, Earthlink in the United States offers bundled home networking equipment on its cable, DSL, and two-way satellite connections. As users often lack the technical skills to configure and deploy a home network, a more successful approach by providers might supply networking equipment and support on how to connect a home network as part of the initial broadband installation.

2.1.6 E-mail address portability

Frequently, adoption of broadband requires a change of Internet service provider with a corresponding change in e-mail address for consumers. Anecdotal evidence suggests that many consumers are reluctant to change their existing e-mail addresses, and this can be seen as a huge barrier to broadband adoption¹¹. In order to entice users with strong ties to old accounts to switch to broadband, it may be beneficial for industry and governments to inform users of their options in this regard.

Some Internet service providers (ISPs) provide forwarding for a limited time to users who migrate to other providers. Sometimes this is free for a limited period, but some providers offer longer forwarding periods for a fee. Sadly, ISPs may not have an incentive to offer these services as it might encourage customers to switch away.

Governments can also play a role in enabling e-mail address portability, as they have done for mobile number portability. One option is for local governments to offer free e-mail accounts or mail forwarding through a government-distributed address, essentially giving residents an “e-mail address for life”. The city of Dublin, Ireland has recently proposed free e-mail services to all residents as part its ten-year plan¹², something that could eliminate the need to use e-mail accounts tied to a specific provider. Another option is regulation to ensure that ISPs continue to maintain addresses in some limited way for a guaranteed period of time.

2.2 Effective use of broadband connections

Economies that have succeeded in promoting broadband haven't just successfully promoted the technology; they've been able to weave broadband technologies into their culture. Examples include teenagers in Seoul, Korea who spend evenings in cybercafés chatting with friends via video,¹³ communities in rural Canada doing virtually all their shopping from home via their broadband connections, and Icelanders playing online games with users around the world.

As an enabling technology, broadband on its own is of little worth to users. Rather, the potential value of broadband lies in the applications that it facilitates, the content that can be accessed, and how users embrace it. The following applications and content are representative of popular use in successful broadband economies. Examining these applications and content should help broadband promoters find ways to encourage their use in their own countries, thus increasing the value of broadband to consumers.

2.2.1 IP telephony

Many successful broadband economies have embraced IP telephony as a way to save money on phone calls by making them over their broadband connections.¹⁴ While IP telephony services have been available for many years, they have only recently developed into a service that works seamlessly through a broadband connection and functionally resembles the PSTN. Users are able to place and receive phone calls directly via a phone and an adapter connected directly to their broadband connection, with no need for a standard telephone line or even a computer. These calls can either be routed to other broadband subscribers or patched into the PSTN, for free or at very low tariffs. Yahoo Broadband in Japan¹⁵ offers its 1.59 million¹⁶ phone subscribers free calls across the country to one another. Calls outside the network in Japan are billed at a flat rate of 2 US cents a minute, as little as one-tenth the price of the same call over NTT's network.¹⁷

IP telephony is particularly appealing in countries with metered local calls, although these services are also very popular in areas with unmetered local usage but metered long-distance calls. Vonage¹⁸ subscribers in the United States, for example, can pay a flat rate of US\$ 39.99 per month for unlimited nationwide calling via their broadband connection. Both Vonage and Yahoo Broadband Japan are heavily promoting their services and this marketing push should help convince users that broadband can be more cost effective than they may think. While IP telephony can be a driver for broadband, offering it can be a very difficult decision for incumbent operators (see the case of Panama in Box 2.4).

Box 2.4: IP telephony in Panama

A regulatory dilemma for the government.

On 25 October 2002, the Panamanian Government passed legislation aimed at preventing the use of IP telephony in Panama. The clearly stated reason behind this legislation was to uphold the contract with Cable & Wireless Panama, a joint venture between the government and UK-based telecommunications provider Cable & Wireless, that entitled that company to a monopoly over phone services. As IP telephony allows Panamanians to avoid using Cable & Wireless Panama for voice traffic, the legislation ordered local ISPs to block 24 ports used to carry IP telephony calls.

While blocking the ports is an effective way of preventing use of IP telephony, it also prevents the use of other applications, such as Telnet, MSN & AOL Messenger, Netmeeting, and a number of other chat utilities that also use those ports. Most importantly however, Panama is a substantial hub for international IP traffic with numerous undersea cables connecting in the country. Through the Panamanian legislation, any traffic passing through Panama would also be blocked on those ports.

After public pressure, most prominently from ISPs, the Panamanian government withdrew the legislation one month later on 25 November 2002.

Source:

Ente Regulador de los Servicios Publicos (2002) http://www.ersp.gob.pa/busqueda/show_resol.asp?id=JD-3576&idsector=1
CNET (2002). Panama Cracks Down on Net Telephony http://news.com.com/2100-1033-965073.html?tag=cd_mh.

Many countries around the world have chosen to ban IP telephony or allow only the incumbent provider to offer it. The primary reason cited for these bans is to protect traditional telephony suppliers who stand to lose revenue from its widespread use. However, this precludes benefits to consumers from lower-prices for voice communication. Furthermore, IP telephony is potentially a significant driver of Internet (and broadband) demand, with much scope for innovation surrounding voice-driven Internet applications.¹⁹ By preventing the

use of IP telephony, those intent on promoting broadband appear to be ignoring a potentially valuable revenue stream and demand driver.

2.2.2 Video over broadband

Television

Television has become a centrepiece of information and entertainment in most cultures of the world. Therefore, if video delivery shifts to broadband, its popularity seems more than likely to increase (see Figure 2.1). Video may yet prove to be the killer broadband application. As an example, the now.com.hk broadband portal in Hong Kong, China delivers true video-on-demand to broadband subscribers. This has in part contributed to Hong Kong, China having the second highest per-capita broadband penetration in the world (see the Hong Kong, China case study for more information²⁰).

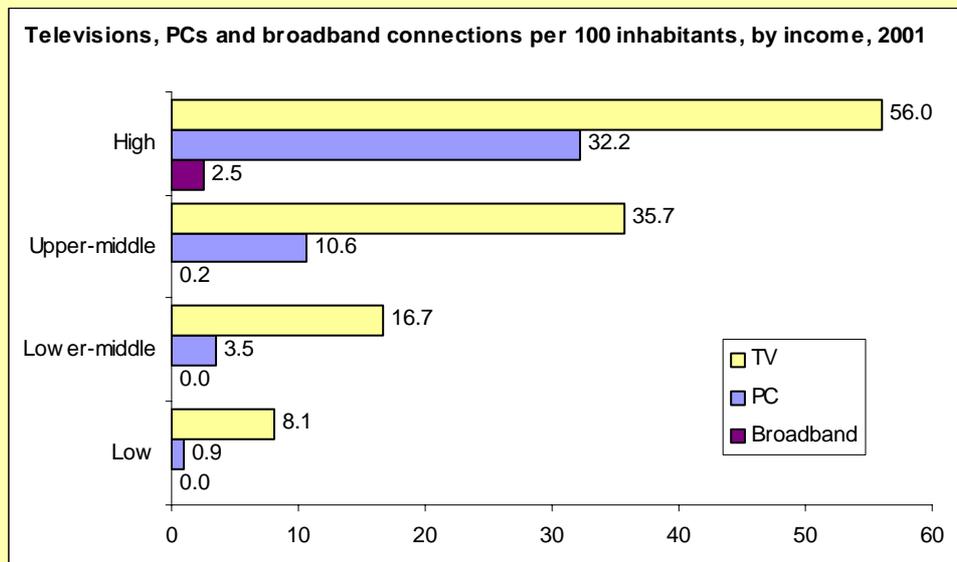
While video over broadband has received much attention and hype, it has only recently been realized at minimal levels in even the most advanced broadband economies. Cable and satellite television technologies already carry huge amounts of video data to households around the world and, at first glance, it may seem redundant to send video over the Internet to homes. This is especially true given the low quality of many Internet video streams currently available. However, this scenario misses the key element of broadband video: access on demand²¹.

Video on demand via broadband is already available in some parts of the world and has the potential to change the way we watch television. Rather than being simply a video stream to a computer, users in Japan are able to watch high definition television (HDTV) programmes directly via their fibre Internet connections. These programmes arrive over the Internet connection to be viewed on the television, the same Internet connections used for traditional Internet connectivity, at extremely high speeds.

While Japan's fibre networks allow for very high-bandwidth HDTV signals, current DSL and cable technologies are fast enough to offer a digital signal for traditional television. New compression technologies and faster line speeds continually improve the quality of the picture above and beyond that of traditional television.

Figure 2.1: The long road for broadband to catch television

While some have claimed broadband will be the future of video delivery, it has a long way to go before it competes with the sprawl of traditional television.



Source: ITU World Telecommunication Indicators Database

Video conferencing

While video-on-demand seems to be a video application of the future, many users in successful broadband economies are already making heavy use of another broadband video technology: web cams, to communicate with family and friends. As mentioned above, users in Seoul often have video chats with

several users at a time. Users typically join a chat room and type their messages on a community board. Each participant's video image is simultaneously broadcast on the screen of other users, creating a video mosaic of all the participants.

Users in Seoul's cybercafés usually use video conferencing to talk with friends, but businesses have also been able to make effective use of the technology. Several video conferencing packages, such as Microsoft's Netmeeting, integrate work-sharing applications, including shared white boards, document sharing, and instant messaging functions. The slower connections of the past made it difficult to have full duplex audio and video while sharing documents, but broadband connections can provide the needed bandwidth for good quality video conferencing at a relatively low cost.

Freelance graphic designers are often broadband users because of the large files they create and move around as part of their work. As they may work from home, sometimes in remote locations, it is vital for them to have good contact with their clients during all stages of design development. One way they foster this is through video conferences and whiteboard sharing via their broadband connections. Designers can let the video conference participants see their work on a whiteboard and can make adjustments in real time. Clients can ask for colour changes and other adjustments that are re-posted nearly instantaneously on the whiteboard.

Broadband promoters will need to examine ways they can encourage video-over-broadband usage. Interactive TV and real-time video collaboration are two services that should be developed, marketed and promoted to encourage broadband adoption.

2.2.3 Audio over broadband

While video-on-demand has not materialized as quickly as many hoped, audio over broadband has already proven to be a killer application capable of driving broadband adoption, especially among younger users. Users in successful broadband economies download music and listen to audio streams over their connections (see Box 2.5 on music over broadband in Belgium). Broadband promoters must promote the availability of legal music, the ability to listen to radio stations around the world, and the higher quality of music over broadband in order to increase penetration levels.

Box 2.5: Music on the cheap in Belgium

How Belgians make and share their music freely via broadband connections

The Belgian site <http://www.belgiummp3.be/> is a forum for artists to post and share their music in MP3 and streaming audio formats. It offers lesser-known, unsigned artists a way to spread their music to a wider audience via broadband connections. The site caters to artists in Belgium and The Netherlands but accepts music submissions from around the world. Since the site only contains legal music authorized by the artists themselves, Belgiummp3.be has been able to secure the approval of SABAM, the Belgian Society of Authors, Composers, and Publishers.

Users listening to music on the site have the option of rating the band/artist for other listeners and potential record labels. Bands and individual songs with the highest ratings are then highlighted on the site. This offers a useful way for the site's visitors to find music that others recommend without having to search through the vast number of musicians posting their music.

The Belgian example shows that broadband users are drawn to legitimate audio over broadband and many musicians are willing to make their music available online for free.

Source: <http://www.belgiummp3.be/>

Many credit the much-contested Napster and other peer-to-peer networks with driving broadband adoption in several economies. Peer-to-peer networks offer nearly unlimited access to free, high-quality audio files, all for the price of a broadband connection. Much to the majority of artists and recording companies' dismay, broadband users open up their computer hard drives, share music, and don't pay any royalties to copyright holders.

Some users argue this has helped the music industry by allowing users to try music before they buy. Others claim peer-to-peer networks are simply piracy havens that have led to a massive decline in CD sales.²² What is clear is that broadband Internet connections are a cheap and efficient way to distribute music. As more music becomes available online, the number of broadband users should increase.

In addition to MP3 downloads, users have been adopting broadband for its ability to stream high-quality music from around the world in real-time. Sites such as <http://www.shoutcast.com> provide links to streaming MP3s in every imaginable genre of music, in a wide variety of languages. Most streams require bit rates between 64 Kbit/sec and 320 Kbit/sec, making them optimal for broadband connections, especially if users want to listen while they do other things on the Web. Other sites such as <http://www.live-radio.net/> offer links to audio streams by country.

Indeed, if users are aware of the audio possibilities with broadband, they would be more likely to subscribe to high-speed services. As the Internet has introduced the ability to listen to music broadcast outside the range of a terrestrial or satellite signal, broadband promoters should highlight the availability of legitimate music on the Web. One broadband selling point is its educational advantage for people trying to learn a foreign language. Broadband users can listen to radio broadcasts in a foreign language and these streams can be used to supplement language classes, offering people an authentic way to hear the language in context. Table 2.1 shows various audio streams in different languages.

Another successful way to promote broadband audio is by highlighting it on ISP portals. Italian ISP Tiscali, for example, does this in two ways. First, it has a “start page” at <http://musica.tiscali.it> that features artists, has concert information, and reports on music news. Second, Tiscali also streams its own music, much like a radio station, but covering many different genres of music. Examples include dance, films, Italiana, rock, and worldwide, out of a total of 21 genres.

While music portals are usually available to all users, they can be especially effective broadband promoters when users are able to adjust the bit rates of the music files. Just as audiophiles upgraded from cassette tapes to CD’s for increased fidelity of sound, high bit rates provide an incentive to upgrade to broadband. Therefore, ISPs should encourage content providers to offer varying bit rates that encourage users to upgrade their sound quality by subscribing to broadband.

2.2.4 Online gaming

While video and audio delivery over broadband have been touted as the bit future applications of broadband, online gaming has slipped in quietly to become an important element driving broadband demand. This is underscored by leading game console manufacturers such as Sony and Microsoft adding Ethernet ports and broadband capabilities to their machines²³ (see the Japanese Case Study for more information²⁴). Until recently, users have mostly played PC games online, but now these game console manufacturers may play a significant role in broadband promotion as their networks come online.²⁵

It is not just console makers who are pushing broadband. Service providers have found success in marketing broadband connections to traditional computer gamers as a way to play their favourite games against each other. In online gaming, fractions of a second can make the difference between winning or losing and broadband is one way to boost a gamer’s chances of success.²⁶ Icelandic broadband providers have taken two interesting approaches to convince online gamers that they need broadband connections. Siminn organizes gaming competitions in stadiums in order to promote its ultra high-speed services to gamers. They argue that, the more bandwidth is available, the better the experience for gamers. Siminn’s competitor Islandssimi takes a different tack by discounting overall bandwidth and emphasizing its fast “ping” rate to Europe (the round-trip response time for an Internet packet) as a major selling point in advertisements. They claim that the faster the response rate, the better chance Icelanders have to compete with players in continental Europe. (See the Icelandic case study for more information.²⁷)

However, successful broadband economies, most significantly Korea and Hong Kong, China, have embraced the interactivity of online gaming and this has helped spur high levels of broadband penetration. While gaming does stimulate broadband adoption, there are other potential social consequences to a broadband user base entrenched in online gaming (see Box 2.6). However, this does not mean that policy-makers should shun online gaming all together. Rather, broadband promoters must look for ways to encourage responsible interactive gaming in an effort to increase broadband penetration.

Box 2.6: Is there such a thing as too much access? -- Korean PC Bangs

Negative consequences for users addicted to online gaming.

In much the same way as slot machines tempted some to dangerous excesses of gambling and addiction, so playing computer games has associated social and health hazards attached. From encouraging people to become sedentary and unfit, to being the “hook” of unhealthy addiction, there may be good reason to watch out for the negative social effects that might be too much of a good thing.

In the Republic of Korea for example, “PC Bangs”, literally PC rooms, are a ubiquitous part of the Korean urban landscape. These rooms cater to game players and are usually open 24 hours a day. Their fast networks and Internet connections make them very popular for collaborative game players who play Diablo, Starcraft, Counter-Strike, and other multiplayer games on the network. These online games have become a major driver for broadband access throughout the country.

The PC Bangs are also commonly used for Internet surfing away from school and home. Students and office professionals alike drop into PC Bangs to send a quick personal e-mail, browse private web pages, chat online, or make VoIP calls, but mostly to play games.

While the PC Bangs are very popular, there have been problems, most notably the death of a student named Kim Kyung-Jae who died after playing non-stop for over 80 hours. The problem has become severe enough that the government has funded a Centre for Internet Addiction Prevention and Counselling.

(See <http://www.internetaddiction.or.kr>).

Source: See the Korean Case Study at http://www.itu.int/ITU-D/ict/cs/korea/material/CS_KOR.pdf and the BBC’s report “South Korea’s Gaming Addicts”, 22/10/02 at <http://news.bbc.co.uk/1/hi/world/asia-pacific/2499957.stm>

2.2.5 Online photos

As digital cameras become more sophisticated, their resolutions are approaching the quality of film. But this has also greatly increased the amount of memory required to store photos. (See Figure 1.3, right, for comparisons). While these larger file sizes have meant higher-quality printing, they have become somewhat problematic for many Internet users who wish to share photos online with family and friends. Downloading a 5-megapixel photo with JPEG compression over a 56K modem will take, at minimum, over two and a half minutes. Even a 1 megapixel JPEG can take around one minute to download.

Broadband promoters should emphasize how broadband connections facilitate online photo sharing by enabling faster uploads and downloads of pictures. Broadband providers could target new camera owners with promotions or even offer bundled services with camera manufacturers. Online content providers such as Yahoo! Photos, <http://photos.yahoo.com>, have created sites specifically for uploading and displaying photos on the Web and ISPs can offer similar services to new camera owners as a way to encourage broadband adoption.

2.2.6 Teleworking

The success of IP telephony, multimedia via broadband, online gaming, and photo sharing all seem to imply that the most successful ways to promote broadband are to appeal to our need to communicate and enjoy entertainment. However, promoting broadband to firms as a teleworking tool could be very successful in increasing broadband penetration.²⁸ Many firms have been hesitant to allow workers to telework because of problems with the network security over the Internet and the inability to stay in touch throughout the day. However, increases in broadband speeds, new security tools,²⁹ and the popularity of instant messaging have allayed many of these fears.

Many large corporations have embraced broadband teleworking as a way to retain employees and minimize office costs. Cisco Systems was able to hire engineers who weren’t willing to relocate by allowing them to telecommute³⁰ and claims the policy has enabled it to retain its best employees, boost productivity, and decrease operational costs.³¹ Obviously, faster connections help foster productive teleworking situations since they create a working environment closer to that in the physical office. Companies also benefit when traditional office employees have fast connections at home as employees can connect efficiently to work during the weekends to take care of urgent business.

Broadband promoters should seize the opportunity to showcase how broadband teleworking can save firms money and improve productivity. As telecommuting has a positive effect on the environment as well, some

governments have offered incentives to firms that allow workers to telecommute. As an example, the Environmental Protection Agency (EPA) in the United States offers pollution credits to firms whose employees telecommute in five major US cities. The pollution credits can then be sold to firms who are struggling to comply with EPA standards.³² The EPA estimates that teleworking can reduce vehicle emissions by 2'613 tonnes per year for every 100'000 teleworkers³³.

Successful broadband economies such as Canada have embraced teleworking and this plays a role in Canada's high penetration numbers. A May 2001 study found that 11 per cent of Canadians work primarily from home (including telework, overtime, or time on their business).³⁴ Obviously any policies and technologies that make teleworking easier and culturally acceptable should increase broadband adoption.

2.2.7 E-commerce and business applications

Successful broadband economies not only have, on average, higher percentages of teleworkers, they also make effective use of e-commerce and business applications over broadband. As businesses are constantly looking for ways to minimize costs and increase productivity, it is important that broadband promoters make businesses aware of the ways in which a broadband connection can provide real benefits to the organization that will justify the expense.

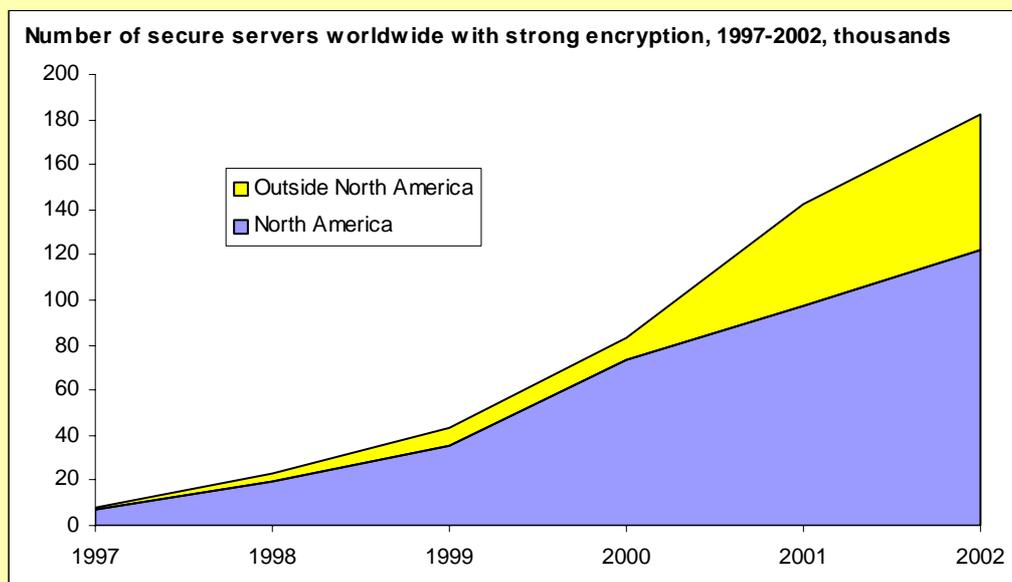
As is the case with households, the high capacity of broadband means that Internet connections can easily be shared among multiple computers on local area networks. For small businesses and home offices that are able to share connections, this feature effectively decreases the cost of broadband for each user. In addition, broadband applications have the potential to bring benefits to small businesses through productivity gains from greater integration of information and communication technologies (ICTs) both within the organization's local network and with its external connections.

For businesses, awareness of available applications typically comes directly from application and content providers themselves, through direct marketing and advertising campaigns, especially those that demonstrate concrete cost savings. In addition, many governments, both at a local and national level, have policies aimed at encouraging the use of e-commerce more generally. As one example, the Vietnamese Government established an E-commerce Master Plan 2001-2005 aimed at driving the use of e-commerce in the country. The plan's ten points include building a nationwide IT infrastructure and increasing awareness through training programmes on e-commerce.³⁵ This increased focus on e-commerce seems to be paying off with more widespread use around the world (see Figure 2.2).

However, perhaps the most effective way of increasing the use of applications that require broadband, and thus increasing the uptake of broadband itself, is through intra-industry pressure. For example, the large organizations in the automobile and retail industries around the world have used their influence within those industries to force smaller players to adopt e-commerce applications such as Electronic Data Interchange (EDI)³⁶ and Just-In-Time (JIT) inventory. Similar pressures on smaller businesses to adopt, say, video conferencing tools or networks for exchanging large data files in graphic-intensive fields, are likely to boost broadband uptake.

Figure 2.2: Growth of E-commerce

Measuring worldwide levels of e-commerce by the number of web servers offering high encryption.



Source: Netcraft, <http://www.netcraft.com>

Note: Strong encryption is a key length of greater than 40 bits.

2.2.8 Local content

One of the key factors in whether people adopt broadband is whether the applications and content available are relevant to them. As up to 70 per cent of Web content is in English, this can be especially difficult in economies where users are not comfortable using English³⁷.

Successful broadband economies have been able to produce content in local languages without relying on English only for content. While more content in local languages should increase all Internet use, broadband adoption may especially benefit. This is because local language content gives users more reasons to stay online and users who spend more time online are often quick to upgrade to faster connections. The availability of Korean content has been an important factor in Korea's phenomenal success since all households, regardless of their English ability, have a wealth of broadband content available to them (see Box 2.7 for more details).

Box 2.7: Local content in Korea

Korea is an exception to the argument that limited English fluency or non-Latin character alphabets are barriers to Internet access. The development of Korean content has been astounding and today the nation has one of the highest usage ratios of home grown content. The top 10 web sites accessed by Korean users are all in Korean. The number of domains registered using .KR—almost exclusively in the Korean language—ranks the nation fifth in the world. Not only has this driven use, but it has also reduced the need for expensive international circuits. It also suggests that in many ways the Internet in Korea is actually one big intranet, with most users accessing local sites.

Korea's top website is Daum, a start-up company founded in 1995. In 1997, it began operating a web-based e-mail service filling a void created by the slowness of Korea's proprietary online services to provide Internet-based content. Around three million pages of Daum's content are viewed on an average day and about 80 per cent of all Korean Internet users log into the service. Daum ranks top in pages per user and session time in the world. Daum is really not much different than other portals except that its business model works. It offers a familiar kind of portal content: e-mail, instant messaging, news, information, shopping, music, videos, etc. and makes money from advertising, e-commerce transactions and members-only portions of its site. But what allows it to earn money is that it is Korean. Few Koreans surf abroad because of the lack of Korean content and lack of ease with English. So Daum has just been better than other Korean portals in attracting customers.

Source: ITU "Internet in Korea" Case Study, 2002, http://www.itu.int/ITU-D/ict/cs/korea/material/CS_KOR.pdf.

In summary, successful broadband economies have adopted and integrated certain technologies and applications into their cultures. On the consumer side, these include IP telephony, video and audio over

broadband, online gaming and digital photo sharing. Businesses also play a key role in successful broadband economies by adopting teleworking, e-commerce, and business-to-business applications. Content in local languages may also play an important role in the fusion of broadband and culture. Economies wishing to promote broadband should examine these successes in order to formulate ideas on how to adapt them to the needs and cultures of their own economies.

2.3 Creating an environment that fosters broadband innovation

While increasing broadband awareness and assimilating broadband applications into the culture are vital for current broadband success, economies must address the future of broadband by creating an environment that is open, innovative, and secure for fostering content and application development. Specifically, an innovative broadband environment must address two specific issues: future content and application development and the subsequent adoption by users.

2.3.1 Spurring innovation

On the development side, entrepreneurs must be offered potential rewards and incentives as payment for developing new applications and content for broadband. Strategies that have been used in various countries to promote innovation in broadband and information technology include:

- Direct public research and development (R&D) funding for content and application creation.
- R&D tax incentives or tax deductibility for new investments, both in infrastructure and intangible assets such as software. These sorts of incentives can also take the form of cash rebates for R&D expenditures that may help spur the growth of young companies that often struggle to maintain cash flow.
- Open and thoughtful consideration of new spectrum uses. Wireless innovators thrive in an environment where open spectrum is available for development. Since one of the biggest hurdles for broadband network builders is the difficulty of upgrading or building out wired connections, governments should encourage development of wireless solutions by making spectrum available.
- Setting up and encouraging the development of technology diffusion programmes, incubators and venture capital funds. As a public/private partnership, the Canadian Network for the Advancement of Research, Industry and Education (CANARIE) helps raise and allocate funds for Internet development in Canada.³⁸ One CANARIE project is the Advanced Broadband Enabled Learning project (ABEL), which will facilitate professional development for teachers via broadband.

Projects such as CANARIE reflect a trend towards greater collaboration between private firms and public research. These sorts of partnership may help provide greater commercialization opportunities for university-based research and increase the efficiency of publicly funded R&D. One difficulty is that privatized research efforts may be too short-term oriented and results based.

2.3.2 Intellectual property rights

Intellectual property rights (IPRs) also play a significant role within an innovation system. IPR laws must strike a delicate balance between offering incentives to content and application creators while still allowing society to benefit from the creations at large. If copyright protection is weak or non-existent, artists may lose much of the financial incentive to create their works. However, copyright protection can be too strong if it limits societal use without increasing the incentives to create at the margin. Policy-makers must weigh up the benefits and costs of current levels of copyright protection, especially if “free” access to copyrighted material is a driver behind broadband take-up. This leaves governments in a difficult dilemma (see Box 2.8). In short then, increasing copyright protection and strengthening existing laws may stifle broadband content. However, unbridled copyright abuse may also reduce content development.

While rights holders are pushing for even stronger laws, researchers (such as O’Siochru and Girard³⁹) have suggested there is a need to realign copyright with its social objective. They claim this is because copyright has been extended to uses beyond its efficient scope and because current copyright cases are denying legitimate, fair use of content in the public sphere. Without addressing the valid argument of weaker protection affecting content supply, it is clear any copyright changes allowing users better access to content will increase the attractiveness of broadband to users.

2.3.3 Attracting foreign investment and knowledge

A positive environment for innovation can function not only to promote local development but may also serve to encourage foreign investment. Many governments have adopted policies specifically targeted at securing investment for and promoting the development of ICT applications in particular regions. Examples of these ICT regions include Silicon Valley in the United States, the Multimedia Super Corridor in Malaysia⁴⁰, Citywest in Ireland⁴¹ and the Digital Media City in Korea⁴². Mauritius is also planning to establish “Cyber Cities”⁴³ along the lines of those in other successful ICT regions around the world. There, municipalities plan to establish high-tech community areas by equipping residential, business and retail buildings with multimedia technology and advanced telecommunication facilities to enable a range of ICT related activities. Ultimately, the hope is to connect these Cyber Cities together to create a “Cyber Island”.

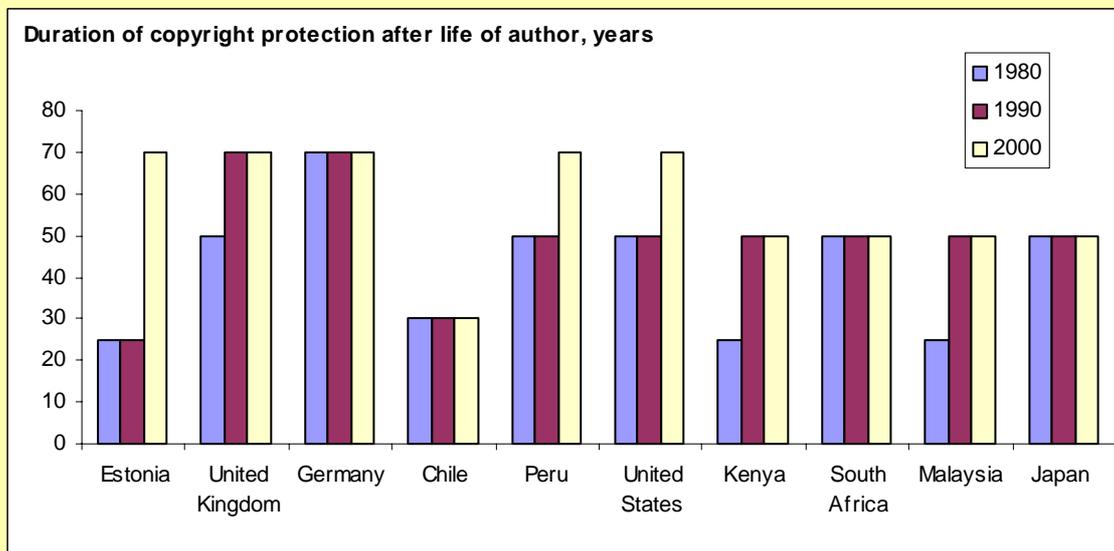
In all these regions, the intention is to bring entrepreneurs together and foster an environment that encourages innovation. The provision of a broadband infrastructure is one way to encourage such developments.

Multimedia areas or digital cities can be beneficial in several respects. Initially, their development brings a direct improvement to infrastructure. However, one of the biggest gains is indirect and comes from technological “spillovers” from relocating firms. As foreign firms hire and train people locally, the ICT skills of the economy grows, aiding local innovation.

Box 2.8: Copyright laws have been getting stronger while illegal content flourishes

Governments are in a bind over intellectual property rights. On one hand, music downloads have spurred broadband adoption, which many governments feel is vital for the economy. On the other hand, content providers are demanding increasingly greater protection for their creations, threatening to stifle some of the incentives to adopt broadband. Large media groups have been more organized at introducing increased protection into national legislation, but many users are crying foul.

There must be a compromise whereby content creators are compensated for their work, while at the same time, users have access to appealing content online. If economic gains attributed to broadband deployment are indeed as high as predicted, it should theoretically be possible to pass a fair share of the gains on to copyright holders. In practice, this is a much more difficult task. Until then, laws will most likely continue to get stronger while music and video files online remain underground.



Source: Reynolds, Taylor W., “Quantifying the Evolution of Copyright and Trademark Laws”, 2003

2.3.4 Multi-channel distribution

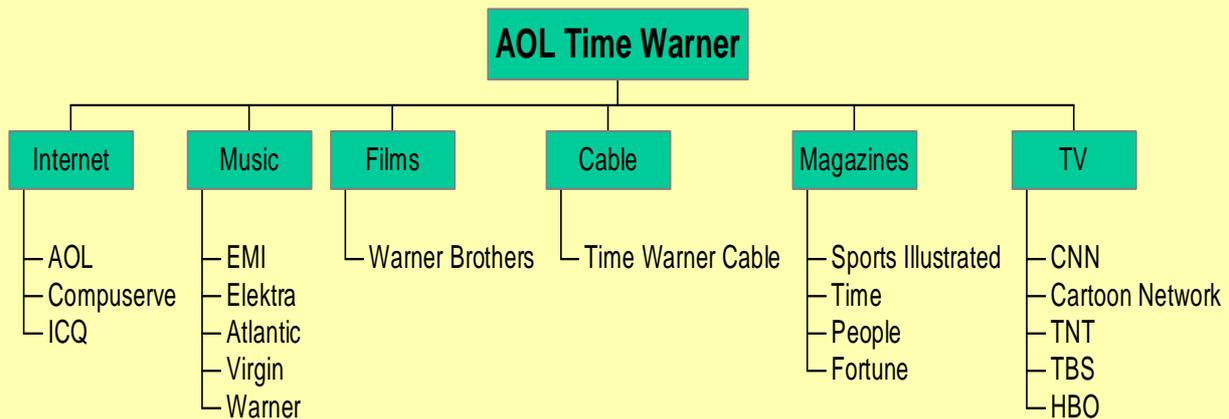
The innovative environment not only fosters the development of new technologies, it provides an efficient method to diffuse new technologies to users. Broadband is only one of many possible channels for diffusing content, such as entertainment to consumers, as individuals can access news items through newspapers, television, radio, and the Internet.

The prevailing thought has been that major investment in the development of content may not be profitable unless that content can be delivered over many channels, such as television and the Internet. The initial trend,

as in the case with the AOL Time Warner merger, was towards content providers partnering with other entertainment providers, such as cable TV operators, to enable multi-channel distribution of content. Figure 2.3 indicates AOL Time Warner's capacity for multi-channel distribution through its vast network extending throughout the entertainment industry. Despite the promise of economies of scope, the AOL Time Warner merger has not been successful and the company may eventually "demerge."

While multi-channel distribution may be tarnished from unsuccessful mergers, the economies of scale it offers could still play a significant role in the development of environment suited to broadband innovation.

Figure 2.3 AOL Time Warner: Multi-channel entertainment opportunities



Source: BBC News (2002). *Broadband Drives Global Mergers*. <http://news.bbc.co.uk/1/hi/business/693793.stm>

2.3.5 Security

The explosive propagation of hoaxes and attacks such as the `jdbgmgr.exe` hoax⁴⁴ has highlighted how sensitive users are to computer security and the steps they will take to protect themselves. Real threats do exist and the always-on nature of a broadband connection makes it an easier target than computers that are only connected for short periods of time. Potential broadband users may hesitate to adopt the technology if they feel it may compromise their personal data or security.

One way to allay fears and increase broadband penetration is for ISPs to include security tools as part of a standard installation. While tools such as firewalls⁴⁵ are freely available for download on the Internet, they can be difficult to configure for most users⁴⁶. ISPs such as Earthlink in the United States, have taken the initiative of helping consumers with security by including firewalls for free as part of their home networking packages, and partnering with firewall producers to make installation procedures more standardized.⁴⁷

Governments can also play a role in increasing security and thus creating an environment that fosters the adoption of new broadband technologies. One method is to introduce strong laws against cybercrime. One example of this type of legislation is India's Information Technology Act of 2000⁴⁸, which effectively makes various cyber crimes illegal by statute. Anyone convicted computer system hacking can be punished with imprisonment of up to three years, and/or a fine. This has a double effect on consumers who either use or are considering signing up for broadband. First, strong laws, stiff penalties, and effective enforcement, in theory, should reduce the incidence of certain crimes. Second, as countries enact legislation, users in those countries become more aware of technologies available to keep them and their data safe.

In essence, broadband promoters must strive to create an environment that gives fair incentives to content and application producers and creates opportunities to transfer knowledge from abroad. In addition, this environment must offer efficient ways to spread content and technology while making sure users are safe.

2.4 Prices

Prices arguably play the most important in promoting broadband demand. Successful broadband economies are characterized by low prices as a result of flourishing competition and innovative pricing schemes to attract a wide variety of customers. As price plays such a vital role in users' adoption decisions, it's vital to understand how economies can use prices as a method to increase broadband penetration. This section will

focus on affordability and pricing strategies while the supply section will examine the effects of a competitive market structure on prices.

2.4.1 Affordability of broadband

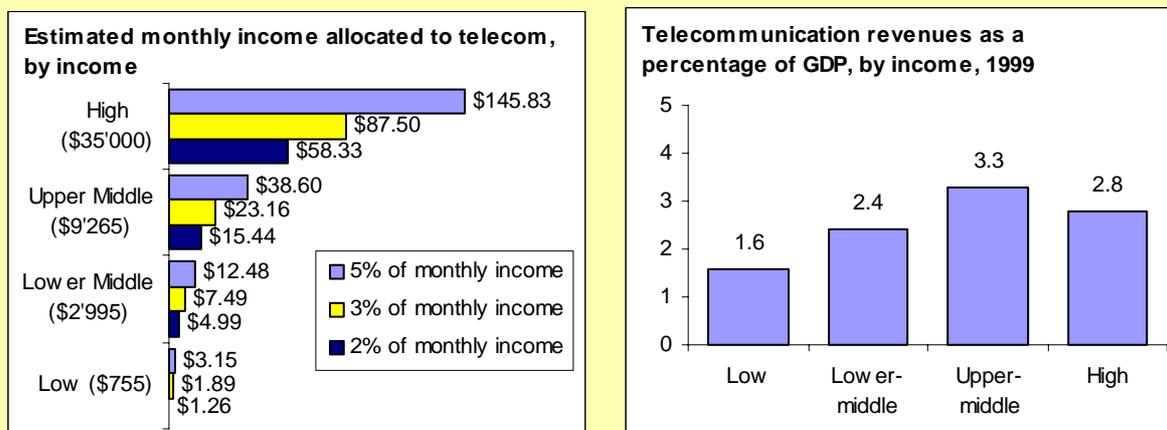
Consumers will only adopt broadband when they can justify its cost in terms of the value it adds. Before considering ways that broadband suppliers can tailor pricing plans to reflect the values of different users, it is crucial to investigate the issue of affordability. It is widely held that telecommunication services, including broadband, should be affordable. However, the meaning of affordability is difficult to define. It includes elements of:

- the ability to pay a price for a service without suffering hardship.
- the degree of need for what is purchased.

Approaches to measuring affordability include income-based approaches that look at the percentage of income spent for given usage (or per unit of use), and consumer-focused approaches that ask people about expenditure priorities and what they think is affordable. It appears that average household expenditure on telecommunication services fall in the range of 1 to 5 per cent of monthly income⁴⁹ (see Figure 2.4, left). Interestingly, this figure is similar to the overall percentage of telecommunications revenues as a percentage of GDP in a range of countries, shown in Figure 2.4 (right), and is also similar to expenditure on information technology as a percentage of income by individual firms.

Figure 2.4: Monthly telecommunication spending

While monthly telecommunication expenditures vary widely, they can be estimated as a percentage of monthly income. Household telecommunication spending should be roughly equivalent to telecommunication revenues as a percentage of GDP (right). Estimated monthly spending on telecommunications (left) looks at the break-off income levels for the four income groups and calculates three estimates of the percentage of income allotted to telecommunications.



Source: ITU World Telecommunication Indicators Database,

ITU calculations based on World Bank income levels and percentage estimates from Antelope Consulting

Note: Based on the assumption that expenditure is equivalent to income groups share of telecommunications expenditure as a percentage of GDP.

While affordability of broadband is clearly a major issue in lower-income countries, it is also an issue in higher-income countries. For example, research by the regulator Oftel in the UK⁵⁰ shows that 3 per cent of the UK population, or around 1.8 million people, are “disadvantaged by the cost” of telecommunications services.

Although competition is the most effective approach to achieving affordability, it may be helpful to develop other policies to bring down prices; introducing concessionary tariffs for specific groups; and providing options such as prepaid schemes that enable users to control expenditure. Consumer research into the affordability of telecommunication services among low-income groups in various high-income societies shows that:

- Lump-sum payments, such as initial connection charges and deposits, present greater affordability problems than call charges. Therefore, eliminating high upfront installation costs increases affordability.
- Timely billing at predictable levels is important.
- Offering consumers options to set limits on their payments, or to buy prepaid services, is useful.
- Helpful handling of debt and disconnection is vital.

2.4.2 Narrowband vs. broadband

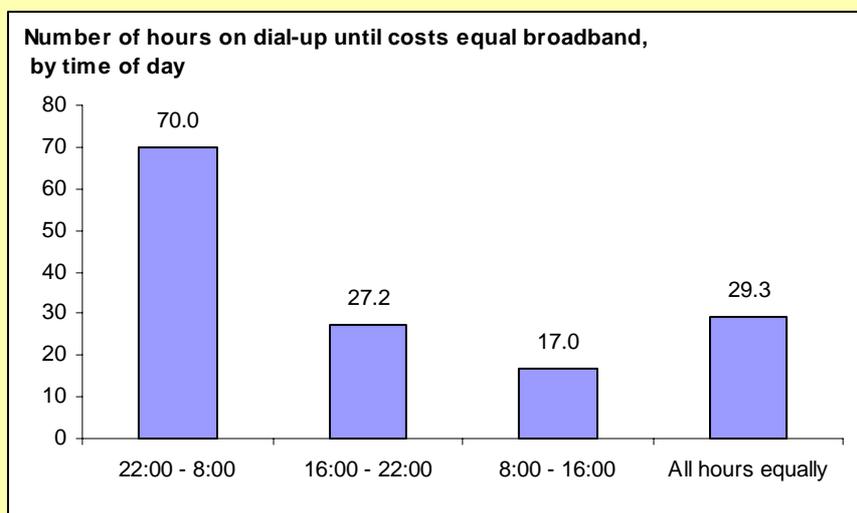
For those consumers that can theoretically afford broadband, the choice of whether to adopt typically depends on the relative pricing of narrowband (dial-up access) and broadband. Around the world, the price of broadband is usually more expensive than narrowband below a certain level of usage; however, a straight comparison is often difficult.

The cost to the consumer for narrowband is composed of the access charge as well as the cost of telephone calls to connect to the ISP. The cost of these telephone calls may become significant, particularly where local calls are metered. Furthermore, if consumers rent a separate telephone line specifically for Internet access, their costs may be even greater.

The use of broadband eliminates the cost of telephone calls to access the ISP, and eliminates the need to rent a separate telephone line for Internet access. In addition, if broadband is thus also used to carry voice (e.g. voice over DSL, cable telephony, etc), it can also result in considerable savings. For moderate to heavy Internet users, broadband often works out cheaper than narrowband. In Switzerland for example, the charges for a dial-up connection are equal to those of a 256 kbit/s ADSL connection if the user is connected for as little as 17 hours per month, just over 30 minutes a day (see Box 2.10).

Box 2.10: Narrowband versus broadband in Switzerland

Narrowband dial-up services are available throughout Switzerland, and ADSL services are also widespread. Dial-up services are most commonly offered without any upfront subscription with users paying only for the time spent connected to the ISP. ADSL users are typically charged a flat rate per month. The following table shows the amount of time that the user needs to be connected per month before dial-up charges are equal to the price of a 256 kbit/s broadband connection.

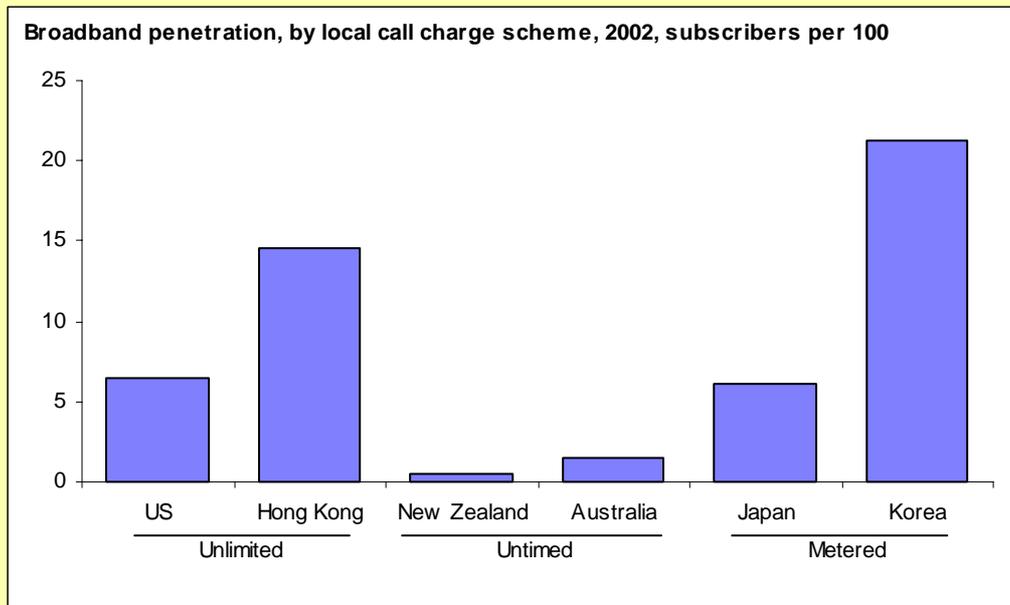


Note: Rates used were valid as of 12 December 2002. Dial-up service measured is Bluewin's FreeWay service that has no monthly subscription fee. Hourly fees are given as follows: 22:00–8:00 = CHF 0.70, 16:00–22:00 = CHF 1.80, 8:00–16:00 = CHF 2.80, all hours equally = CHF 1.67) The broadband service is Bluewin's BroadWay service at 256 kbit/s downstream and 128 kbit/s upstream at US\$ 35.59 (CHF 49/month). Bluewin is the ISP associated with the incumbent operator, Swisscom.

Local call pricing regimes differ around the world but fall into three general categories: untimed, metered, or unlimited. Australia and New Zealand, for example, have untimed local calls where there is a flat-rate charge for the duration of the call. Economies such as Germany, Japan and Korea have metered calls where prices

are calculated based on the duration of the call. Some economies such as the United States, Canada and Hong Kong, China have unlimited local calling for a flat monthly rate. Accordingly, the total cost of accessing the Internet over narrowband tends to be cheapest in countries with untimed or unlimited local calls. The costs are higher in countries where local calls are timed on a per-minute basis. While these factors may limit the relative advantage of broadband over narrowband they do not serve to explain differences among countries with the same calling structures (see Figure 2.5).

Figure 2.5: Local call charges don't tell the whole story



Source: ITU, Note: New Zealand figures are from year-end 2001. Hong Kong refers to Hong Kong, China.

2.4.3 Broadband pricing strategies

Broadband pricing strategies vary widely. Some trends and interesting issues arising from pricing strategies are discussed below.

Flat-rate

Broadband suppliers in many countries have opted for a “one-size-fits-all” approach to broadband pricing where subscribers are charged a standard flat monthly rate. This charge is not influenced by the level of usage.

Innovative variations on this theme have seen many providers offer a reduced-cost entry-level service as a way of encouraging take-up. The target appears to be to build a subscriber base, and lock users in to longer-term contracts. In North America, there are a variety of offers that provide the first month of service for free, or the first 3 or 4 months for a reduced tariff (say US\$ 30 instead of US\$ 50 per month). These offers generally involve a contractual commitment of at least 12 months. Furthermore, it is common for providers to discount the activation fee, equipment charge or installation fee for customers who sign up for a 12-month contract or more. Korea Telecom offers a sliding scale for DSL modem rental charges, with the modem considered purchased after three years.

Table 2.1: Broadband prices in select economies

Country	Price (US\$)	Speed (down/up)	Type	Company	% of monthly income
Australia	53.00	1200	DSL	Telstra	3.4
Austria	52.91	512/64	DSL	Telekom Austria	2.7
Belgium	32.57	3000/128	DSL	Belgacom	1.8
Canada	30.64	1000/160	DSL	Bell Sympatico	1.6
Denmark	48.97	256/128	DSL	Tele2	1.6
Finland	54.30	256/128	DSL	Sonera	2.8
Hong Kong, China	38.00	3000	DSL	PCCW	1.9
Iceland	37.20	512/256	DSL	Íslandssími	1.3
Japan	21.29	12000/1000	DSL	YahooBB	0.7
Korea, Rep. of	22.84	8000/800	DSL	Hanaro & KT	3.0
Netherlands	52.57	1024/256	DSL	Versatel	1.8
New Zealand	43.44	2000/800	DSL	FastADSL	1.4
Norway	46.11	704/128	DSL	Tele2	1.5
Singapore	32.88	1500/1500	Cable	Starhub	1.9
Sweden	40.64	512/256	DSL	Tele2	2.1
Switzerland	35.58	256/128	DSL	Bluewin	1.3
Taiwan, China	25.53	1500/384	DSL	So-net	2.4
United Kingdom	36.74	512	DSL	Pipex ADSL	1.9
United States	42.95	1500/256	Cable	Comcast	1.4

Source: ITU.

Note: DSL prices do not include line rental charges which are required for service. The prices assume the line rental charge is already paid for phone service. Prices and exchange rate data based on March 2003.

Volume-based pricing

While the price of dial-up Internet is often based on time spent online, the always-on nature of broadband means that the pricing model may require volume-based (or per-megabyte) charges if capacity is scarce. Accordingly, broadband suppliers in some countries set the price of broadband to consumers on the basis of volume downloaded. In some countries major broadband suppliers (e.g. Telstra in Australia) have gone as far as to place (potentially very restrictive) monthly download limits on some plans (sometimes as low as 100MB per month), with penalties for exceeding this limit. Broadband suppliers cite a desire for equitable usage of broadband networks (cable) as the reason behind these moves.

Iceland is another geographically isolated island state that has used volume-based pricing to keep costs down for international connectivity. Islandssimi offers 512 kbit connections with 500 MB of international download included in the US\$ 37 monthly subscription. Users then pay US\$ 0.03 for each additional megabyte of foreign download (see the Icelandic case study for more information⁵¹).

It would seem that pricing based on volume can have an overall adverse effect on broadband promotion as it tends to restrict usage patterns and may discourage the take-up and experimentation with broadband services. Significantly however, an impressive amount of content (including songs, movies and live sport) owned by

Telstra in Australia does not count towards their download limits on subscribers, suggesting that the motivation is not bandwidth rationing but leveraging content advantage.

Product bundling

Operators that supply multiple services (such as mobile and fixed telephony, cable TV, as well as broadband) often offer product bundles, whereby the price of broadband is reduced if the consumer subscribes to other services as well. For example, operators may offer a reduced price for cable Internet subscriptions if the consumer also subscribes to the operator's Cable TV services. In the United States, the cable provider Comcast's charges are 33 per cent higher for broadband Internet subscribers who do not also subscribe to cable TV on their network. Cox Communications and SBC both offer discounts to broadband subscribers who also subscribe to cable TV or phone services respectively⁵².

However, this type of bundling is only efficient in a competitive market with open access or local loop unbundling in place. While bundling can have a positive effect on a competitive market, it can have negative effects where access is closed or limited to few providers. As an example, some broadband providers have mandated that their DSL subscribers place phone calls only through their network. These types of policy may actually decrease broadband demand by forcing broadband users to pay prices for phone service that may be higher than the competitive rate. Regulators need to keep a close watch to ensure that firms with dominant market positions in one area do not use bundling of services to extend this advantage in other areas.

Tiered pricing

Many broadband suppliers have introduced tiered pricing plans, in recognizing that particular attributes of broadband are valued differently by different consumers. For example, consumers that make extensive use of online chat may value always-on connectivity ahead of high speed, while online gamers may insist on speed above all.

Tiered pricing plans involve offering a range of connection speeds at a range of prices. For example, in Canada, a cable broadband provider scrapped its US\$ 27 flat fee in 2002, instead offering a US\$ 17 service that offers only 128 kbit/s downloads and 64 kbit/s uploads, and a US\$ 30 service offering downloads at 1.5 Mbit/s and uploads at 192 kbit/s (the speeds of its former US\$ 27 service). Tiered pricing schemes increase the options available to consumers and reflect a shift towards a consumer demand focus.

Acca Networks, an ADSL wholesaler in Japan has taken an interesting approach to tiered pricing by using an ordinary 8 Mbit line and technically limiting it to 1 Mbit download and 512 kbit upload. At US\$ 11 a month⁵³, this effectively offers a lower entry point for low usage subscribers without cutting into its higher paying subscription base.

Prepaid

While prepaid cards for dial-up Internet access have proved popular in Thailand, the Philippines, Vietnam, and elsewhere, prepaid cards for broadband have not been offered widely. One area where prepaid is gaining a foothold is in the market for temporary wireless broadband access via public hotspots. It is becoming more common for airports and train stations to offer broadband access. However, the pricing plans are often prohibitive for those who are not planning on using the service for several hours. Swisscom introduced wireless access in train stations around Switzerland in January 2003, but with very high connection fees. Users must purchase either 2 hours at US\$ 14 or 24 hours at US\$ 35.⁵⁴ Interestingly, the charge for just 24 hours of WiFi use is equivalent to a one-month Swisscom subscription to 256 kbit ADSL.

In summary, successfully broadband economies are typically those that have been able to inform users about broadband through schools, government programmes, and various marketing strategies. They have also been able to merge new broadband technologies such as IP telephony, multimedia over broadband, online gaming, and various business applications into their cultures. Successful economies create an environment that fosters broadband innovation through attempts to spur innovation, careful management of intellectual property rights, varied distribution channels and by providing security to users. Finally, countries that have successfully promoted broadband have competitive market structures and innovative pricing schemes that keep prices low.

3 Promoting Broadband Supply

Fundamentally, the objective of broadband supply is to provide all those who would like broadband with the opportunity to access it. This section discusses issues, strategies and ideas for promoting the supply of broadband, while focusing on economies or regions where efforts have been particularly successful or interesting. The section also highlights possible roles for governments, regulators, telecommunication suppliers and the private sector in general.

A successful broadband economy can be characterised by:

1. **Having a competitive market structure.** Strong inter-modal competition as well competition among the same technologies leads to lower prices, increased feature offerings, and more extensive broadband networks. Cross-ownership by operators will decrease broadband penetration and should be remedied. Competition policy authorities must continually monitor the competitive structure of the market and must be empowered to take action when necessary.
2. **Having government programmes in place that focus on broadband.** Local, regional and national initiatives have been successful in connecting communities to broadband. Direct infrastructure investment by governments can play a key role in developing broadband networks, especially in underserved areas. Tax credits, low-interest loans, subsidies and other government programs can also be important methods of stimulating broadband supply.
3. **Applying innovative ideas to expand the network.** Existing networks must be utilized to their full extent alongside new network investment. Innovative broadband networks such as wireless, satellite, railway and electrical can be used to supply broadband. Schools, hospitals, and community access centres can serve as initial broadband anchors in areas, eventually becoming the network access points from which future networks can expand.

The section begins by examining the roles competition policy and regulation play in determining broadband supply. Next, the section looks at how governments have directly encouraged broadband supply through various policies and initiatives. Finally, some innovative approaches to supplying broadband are presented. Further information is available in the country case studies at <http://www.itu.int/broadband>.

3.1 Competition Policy and Regulation

It is widely held that competition in broadband supply is crucial for reducing prices, improving quality of service, and increasing customer service. Governments around the world take different approaches to managing competition, with some choosing a proactive approach to ensure competition (*ex ante*), while others remaining reactionary – intervening only when there appears to be an unfair use of a dominant position in the market (*ex post*).

A difficulty for regulators is that broadband seems to be pulling together previously distinct markets, thereby changing the entire communications landscape. This converged market place now includes, amongst others, telecommunication providers, cable TV companies, satellite TV companies, and ISPs. This makes efforts to ensure a competitive broadband market complex and highly dependent on the overall environment.

Convergence can increase competition by promoting inter-modal competition, but in certain circumstances, it can also reduce competition because multiple services can be provided over the same network. This may serve to strengthen monopolistic tendencies⁵⁵.

3.1.1 Competition

While market prices for broadband depend on many factors, there are three elements of successful markets that are common among successful broadband economies.

1. **Competition via open access:** Prices invariably fall when DSL and cable providers are compelled to open up their networks to competitors. This process is sometimes called unbundling the local loop (ULL).

2. **Strong competitive carrier:** While open access is a first step, the best way for prices to fall is when there is a competitive carrier with deep pockets which is strong enough to compete effectively with the incumbent.
3. **Inter-modal competition:** In addition to competition within a sector, prices fall when several broadband technologies compete for the same customers. The existence of strong DSL, cable, wireless and metro Ethernet providers in a market will ensure prices remain low.

Korea is one of the best examples of a well-functioning market because all three elements are in place to bring down prices. DSL suppliers all have access to Korea Telecom's (KT) local loop and have bid down DSL prices. Second, while KT remains the largest DSL provider, Hanaro Telecom was first to market with DSL and still has roughly one third of the market share. Hanaro's owners include major Korean companies such as LG, Samsung and SK Telecom. Korea also has multiple types of broadband available to most subscribers. Users can connect via DSL, Cable, LAN, satellite or WLAN. The combination of market dynamics has helped Korea develop a subscriber base per capita that is nearly twice the level of the next leading country in the world. This strong competition on all fronts has given Korea some of the lowest broadband prices in the world. Entry-level plans start at US\$ 22.84 (30,000 Won) and faster connections are closer to US\$ 30 a month. More information can be found in the Korean case study⁵⁶.

Japan's immensely competitive market is also characterised by all three elements and has quickly become one of the world's leaders, boasting the lowest broadband prices in the world. Japan reached this milestone after YahooBB entered the market and pushed ADSL market prices down 50 per cent on the local loop from US\$ 40, (JPY4,800) to US\$ 20 (JPY2,400). YahooBB's low prices and innovate services have increased its market share to 33 per cent, just slightly lower than NTT, making it a very strong competitive carrier. In addition to having open access and a strong competitor to match NTT, Japan has inter-modal competition from a wide group of technologies including cable, DSL, fibre, and wireless services. The interaction of these three factors has had an astounding effect on broadband in Japan. In the year following YahooBB's entry in the ADSL market, the number of ADSL subscribers increased five hundred per cent (from 922'000 in Oct 2001 to 4'640'000 in Oct 2002). Not only did the number of subscribers increase, fierce competition led to faster broadband speeds, with ADSL speeds jumping from 1.5 Mbit in 2001 to 12 Mbit, and fiber speeds reaching 100 Mbit. For more information see the Japanese case study⁵⁷.

3.1.2 Regulating the Broadband Market

Competition has had profound effects on broadband markets, specifically in Korea and Japan and policy makers around the world can use competition regulation to help foster other successful broadband markets. While extremely important, this is not a simple task.

There has been much debate over what exactly constitutes the broadband market and different interests have different ideas. A common way to define a market is by the cross-price elasticities between goods. If a change in price in one of the goods significantly alters the quantity demanded of another good, both goods may be said to be in the same market. When viewed in this way, the market definition of broadband likely includes all high-speed Internet access, even though technologies, data transmission speeds, and providers may vary. However, it is worth noting that a broad market definition based on the number of potential providers does not imply that the market is truly competitive.

So, while different types of broadband (e.g. DSL, cable model, WLAN, etc) may be considered to be in the same market, governments often have regulations that do not apply evenly, or in a technologically-neutral manner. This is most evident with regulations imposed on incumbent telephone operators, who are often seen as dominant players. For example, some governments have mandated that incumbent telephone operators open up the local loop to competitors, in an effort to reduce the power of the incumbent and facilitate competition in the DSL market (unbundling the local loop). The view was that the cost of duplicating local loop investment could be considered to be a major barrier for companies seeking to provide services over a twisted pair telecommunications network. These moves have unsurprisingly met with great opposition from incumbent operators. While admitting they have control over the local loop, they insist the broadband market is much broader and that, in fact, they are not a dominant operator when other broadband options are taken into consideration. They point to cable and wireless providers as competitors in the full broadband market and argue that forcing them to sell access to competitors at regulated rates will reduce their incentive to invest.

The United States is one country where the incumbent operators have complained about the asymmetric nature of broadband regulation. Until recently, the Federal Communications Commission (FCC) refrained from requiring open access to cable TV networks while requiring unbundled access to the local loop. However, the FCC recently reclassified broadband services provided over both the fixed local loop and cable TV networks as “information services”, in effect removing these services from access regulation⁵⁸ (see Box 3.1).

Box 3.1: The broadband infrastructure gamble in the United States

The FCC has decided to rebundle the local loop for broadband over phone lines in an attempt to spur infrastructure rollout.

On 20 February 2003, the US Federal Communication Commission (FCC) ruled that incumbent local carriers no longer have to offer last-mile access to competitors over their networks. The ruling is an attempt to spur investment in next-generation networks such as fibre, with the reasoning that incumbent operators will be unwilling to make investments in next-generation networks if they are forced to sell access to competitors at wholesale rates.

The ruling is controversial, especially because it applies to the existing copper networks in addition to future network infrastructure. As a result, prices are expected to increase in the short term as the number of competitors in the market falls. This was highlighted by the FCC Chairman, who noted that up to 40 per cent of all DSL providers use line sharing inputs. He stated, “The decision to kill off this element and replace it with a transition of higher and higher wholesale prices will lead quite quickly to higher retail prices for broadband consumers”.

Many successful broadband economies have achieved their high penetration levels precisely because of local-loop unbundling and strong competition. While the goal of encouraging investment in higher-speed networks is a positive one, many of the economies with unbundled local access are also leading the world in the development of high-speed fibre networks.

Source: FCC press release http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-231344A1.pdf

Chairman Powell’s statement: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-231344A3.pdf

3.1.3 Maintaining competition

Regulation plays an important part in determining broadband supply, but competition policy alone will not ensure that there is true competition in the market. This is particularly relevant in developing countries where a single telecommunication supplier is often dominant. In South Africa, as one example, the monopoly of the incumbent operator, Telkom, officially ended in May 2002, but as of the start of 2003, there was still effectively no competition in the telephone market. A second national operator was only scheduled to be licensed by March 2003. In such cases, it would seem prudent for governments to consider alternative measures to introduce competition into the market.

In the broadband market, if there are no cable, fibre, or wireless networks in place to compete with DSL, there may be a lack of inter-modal competition. In these cases, it would seem beneficial for the government to encourage the development of alternative broadband infrastructure. Governments could, for example, issue licences for alternative networks such as WLAN or fixed wireless and permit self-provision of these services. The development of wireless broadband technologies may gain further importance if laying cable or fibre networks is not feasible. Governments can aid this process through streamlining processes of allocating spectrum for wireless broadband as previously mentioned in section 2.3.1.

Looking to the future, as fibre to the home becomes a reality, it can be expected that a single supplier will control access to the fibre network. Furthermore, the high speed of fibre networks may preclude the availability of effective substitutes for fibre. In this event, problems with monopoly power will again be prevalent. However, in this case, the issue of asymmetric regulation (such as that between DSL and cable), cited as a drawback of unbundling the local loop, may not be as much of a problem if there is not a perfect substitute for fibre. Accordingly, regulators may eventually open access to these fibre networks as a way of effecting competition.

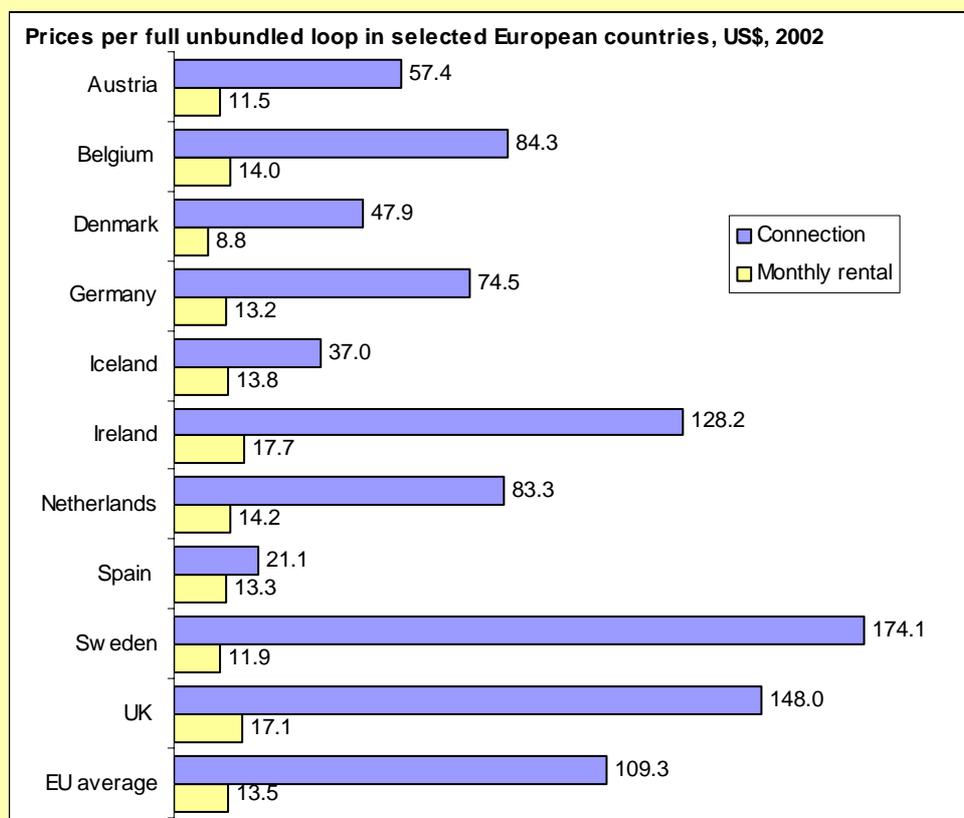
A further dilemma for policy-makers working to promote broadband is that even in areas where, on the surface, there appears to be inter-modal competition, individual consumers may only have one broadband option. DSL is limited by the distance from the central office to the premises. Cable is limited to residential areas with upgraded cable TV networks while wireless broadband is often limited to areas with line of sight connectivity. As such, while there may be many players in the market, they may not operate in the same

geographical area. As a result, it is vital for policy-makers to clearly understand the structure of each market and to take appropriate steps to ensure their smooth functioning.

Even in areas where local loop unbundling has been implemented, the behaviour of incumbent operators can still often be viewed as stifling competition. One area where this is evident is in the fees they charge for access to the network. For example, line rental costs within Europe are similar among countries, but the initial one-off connection fees vary widely and can be high enough to reduce incentives for reselling ISPs (see Figure 2.3). Another problem arises when wholesale pricing regimes of incumbents discriminate against smaller ISPs. Wholesale rates are often only attractive for extremely large purchases that would be available only to large service providers. In markets with small ISPs that tend to grow incrementally, these pricing regimes exclude effective competition. A possible solution to this problem is seen in the case of Korea, where the government worked to bring together multiple stakeholders to create Hanaro Telecom, an entity which is sufficiently large to rival the incumbent Korea Telecom.

Figure 3.2: Uneven pricing for access to the local loop in Europe

Monthly rental charges are similar but there are vast price differences for the initial connection charge.



Source: European Commission, Icelandic PTA, Icelandic case study.

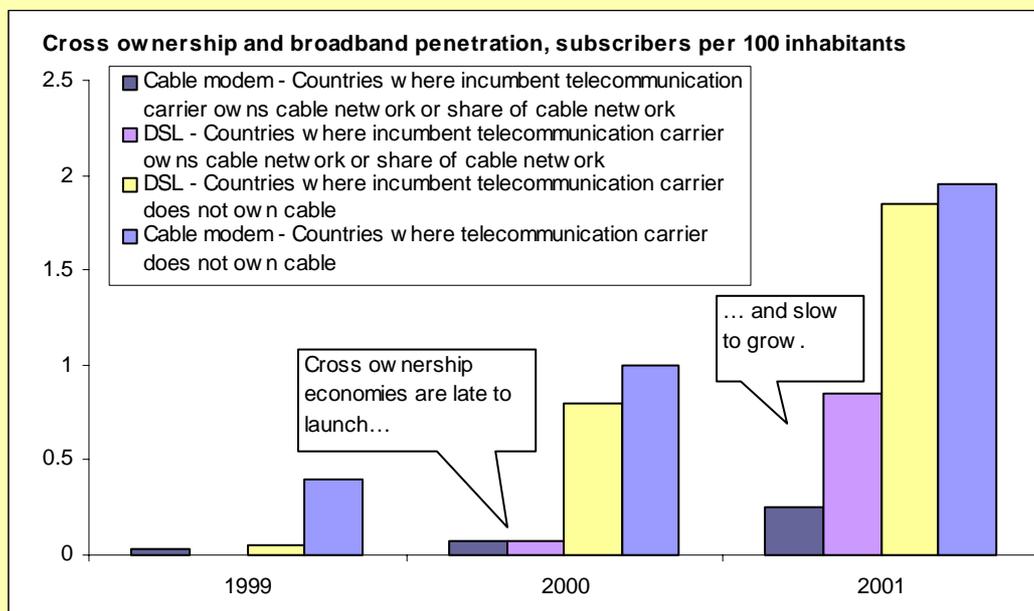
3.1.4 Cross-ownership issues

Several broadband markets around the world have struggled with broadband roll-out because of cross-ownership issues. This is a situation where major telecommunication operators also own portions of a cable company or cable operators own telephone networks. The result is a provider that has disincentives to roll out both DSL and cable modem technologies since the two would compete against each other. In this situation, often only one of the two technologies is introduced and prices tend to be high (see Figure 3.1). Several Nordic countries have had a particularly difficult time with cross-ownership issues and the effects are evident in their lower than predicted broadband penetration rates. The OECD⁵⁹ has found that while Nordic countries have high cable TV and telephone subscription rates, no Nordic country (with the exception of Iceland) was ranked higher than 7th in overall broadband penetration.⁶⁰

Many economies have taken steps to ensure cross-ownership problems do not stifle broadband deployment. For example, the European Union adopted a directive in 1999 that stipulated the separation of cable and telecommunication activities of dominant telecommunication firms⁶¹. One of the companies affected was Deutsche Telekom, which was obliged to sell off its cable TV holdings.

Figure 3.1: The corrosive nature of cross-ownership

Countries where incumbent telecommunication operators have stakes in companies offering competing broadband services have significantly reduced levels of broadband penetration.



Source: Adapted from OECD, *Broadband Access for Business*, 2002

In summarizing this section on competition, it is worth considering the case of Korea where the broadband penetration is the highest in the world. There, competition exists through open access to the local loop as well as a high level of inter-modal competition. Furthermore, the competition environment is aided because Korea has a strong second player, Hanaro Telecom, which is able to take on the incumbent Korea Telecom. While it is difficult for countries to copy wholesale the policies of other countries which naturally have different socio-cultural conditions and markets, it is nevertheless worth noting that Korea has achieved success through having competition in multiple spheres.

3.2 Governments and broadband

While a competitive market structure is essential for promoting broadband supply, governments can also play a key role through policies intended to accelerate network rollout. As a result, it is vital to understand the different roles governments can take in promoting broadband supply. The following sections examine the different frameworks for broadband supply and how governments can use tax credits, low-interest loans, government subsidies, and certification programs to strategically expand broadband networks.

3.2.1 Government frameworks for broadband supply

Countries around the world have adopted different approaches to promote and extend broadband access. These approaches can be classified roughly into three categories⁶²:

a. “Light touch” regulation (e.g. New Zealand and Switzerland)

This model is based on minimal central government intervention in the private sector. Characteristics of this type of intervention are as follows:

- Definition of a transparent regulatory framework to encourage competition and open access.
- No direct government subsidies for broadband expansion and access.

- Government commitment to investing funds to improve professional skills, education and training; but not necessarily direct funding for schools, universities or public institutions to improve broadband infrastructure.
- Government funds for research and development.

b. Cooperative model: programmes aimed at bridging the digital divide and improving access (e.g. Australia, Germany, United Kingdom, United States)

This model is based on public policies oriented towards preventing discrimination between those who have access and know how to use the technology, and those who do not. This model assumes that the market alone is not capable of eliminating such disparities across the country, and therefore focuses attention on policies targeted at specific areas and social groups that might otherwise suffer exclusion in the short term or be served only at a late stage in service roll out.

While the private sector offers service in major cities to middle and high income socio-economic groups, government policies would support development of broadband infrastructure in those parts of the country that are not economically appealing to providers. This model is based upon the following features:

- Direct subsidies to groups and communities living in rural areas for last-kilometre (or last-mile) broadband connection;
- Close central cooperation with regional, town and other local government;
- Extension of universal service concepts to Internet access;
- Government-supported educational and training programmes;
- Initiatives for distance learning, telemedicine and broadband applications to boost economic development or to demonstrate technologies

c. National plans targeted at broadband development (e.g. Republic of Korea, Norway, Singapore)

In some countries, governments have taken the lead in national technological development. This solution has been preferred in countries with a tradition of strong State guidance of private sector strategy and investment, and where industrial policy is strongly influenced by the State.

Some of these countries have developed far-reaching investment plans and strategies that place development of broadband networks in the context of nationwide socio-economic plans. The principal characteristics of this model are:

- Combining elements that exist in the other models, such as the universal access principle for broadband, transparency in regulation, education campaigns and wide-ranging training initiatives, etc.
- A wide range of government actions that many span direct subsidies for the development of infrastructure, education and training plans, involvement of all levels of government (central and local), changes to legal frameworks, trade policies, and promoting the attraction of qualified staff.

3.2.2 Tax credits / low-interest loans

While the three categories above refer only to national government initiatives, municipal and local governments can also use policy initiatives to promote private investment in broadband infrastructure. These include providing incentives, such as tax credits or low-interest loans, to develop and rollout broadband technology. One such example is the State of Michigan in the United States, where legislation passed in March 2002 created a new "Broadband Development Authority" that is empowered to issue State-backed bonds and offer very attractive 20-year loans to public and private entities for fibre build-out⁶³. Michigan also provides tax credits to telecommunications providers who invest in new broadband infrastructure.

It is difficult to assess the success of these sorts of policy. Even where they apply, initiatives such as tax credits typically form too small a part of the overall broadband supply environment to allow its effect to be gauged. Furthermore, individual policy initiatives do not operate in isolation. As an example, while a 10 to 20 per cent tax credit may help offset some of the capital costs associated with network expansion, many carriers might still be reluctant to deploy new services if line-sharing requirements are applied to broadband offerings.

3.2.3 Government subsidies

Some governments subsidize broadband by reducing the price of broadband to selected consumers. In the United Kingdom, for example, several regional development agencies and devolved administrations have created the Remote Area Broadband Inclusion Trial (RABBIT)⁶⁴. Their goal is to subsidize broadband connections for small businesses in remote areas not reached by DSL or cable. Qualifying companies can receive up to US\$ 1'100 (GBP 700) towards one year of satellite broadband service. It is typical for these subsidies to be in the form of a one-time payment – with governments hoping that once users become accustomed to broadband connections they will not give them up when the subsidy ends.

Some governments have also implemented tax reductions for broadband investment. Again, the UK provides a typical example where small businesses are allowed a 100 per cent offset of expenditure on broadband access equipment against taxable income. Employer-provided broadband to the home is also exempt from tax.⁶⁵

3.2.4 Direct involvement of local government

At the regional and city level, local government has sometimes taken a lead in promoting broadband rollout to their communities. An advantage that city and local governments have is that they often control rights of way and access to homes and business, for instance, through water or sewerage pipes that can be used for laying cable. They also have an understanding of the local community, putting them in a strong position to develop and supply broadband infrastructure.

Many Swedish municipalities have been particularly innovative in broadband supply. In the remote northern village of Vindeln, which is connected to the national fibre backbone, the failure of operators to roll out broadband directly to the homes has driven the municipality and the residents themselves to lay fibre directly to the homes.⁶⁶ In Stockholm, a company called Stokab, which is jointly owned by the City of Stockholm and the County Council, has built and continues to operate a fibre-optic network on an operator-neutral basis. It acts as a wholesaler, offering fibre to operators that provide services to business and residential customers.⁶⁷ Other developments in Stockholm have seen a municipal power utility, Sollentuna Energi, build a fibre network connecting 12'000 individual homes.⁶⁸ Their original intent for rolling out fibre to homes was to do remote meter readings, but now residents are able to use the network for high-speed Internet access.

Box 3.2: Wire a building in Japan? Super vs. simple majority

How a clarification of a Japanese regulation has made make wiring apartments easier for tenants who want high-speed access.

The Japanese government has taken a proactive step to increase the number of apartment buildings wired for broadband through a change in the Building Partitionary Property Act. Apartment buildings have been difficult to retrofit for broadband if few tenants are willing to agree to pay for the upgrade. The law states that improvements in public places of buildings require approval by three-quarters of the residents if it would “greatly change the public space.” Only a simply majority was necessary for minor changes.

It was unclear until just recently whether retrofitting would be considered a major change or a minor improvement requiring the approval of fewer residents. This was important since it was often difficult to convince three-quarters of the tenants that broadband retrofitting was indeed worthwhile. Without a an overall majority, no tenants would be able to enjoy high-speed broadband.

In December of 2001, the Japanese government decided that broadband technologies would be considered minor improvements and would therefore only require 50 per cent approval before the changes could go ahead. This simple change in the interpretation of the law has meant that many more buildings can be wired than if the overall majority requirement were still in place.

Source: Japanese case study: <http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/japan.pdf>.

Another example is an integrated approach to developing “smart neighbourhoods” that has been adopted in the Netherlands through an organization called “Kenniswijk”.⁶⁹ This broadband promotion initiative is a public-private partnership, bringing together businesses, institutions and governments. In the region allocated to Kenniswijk projects, comprising 40,000 homes and 84,000 residents, businesses and institutions can experiment with new electronic services for the consumer market, through trials involving the residents in the area. Kenniswijk offers subsidies for providers of innovative services and assists with marketing, communications and user research. By the end of 2002, after lengthy planning phases, fibre to the home has been implemented in a test bed of 360 homes, broadband public access facilities have been established, and a broadband demonstration centre is available to educate residents and showcase new services.

The message that these examples provide is that if local governments want broadband for their residents, it may be possible for them to do this themselves rather than wait for telecommunications companies to provide it. Importantly, these solutions require a regulatory framework that makes it possible for small groups, such as municipalities, to register as carriers. The regulatory regime in Canada is an example of one that is favourable to these arrangements for building infrastructure. There, anyone can become what is termed a “non-dominant carrier” through a straightforward registration process, and can then attach themselves to almost any facilities. More information on Canada’s broadband environment is available in the Canadian case study.⁷⁰

Governments can also take a less active role and still help promote broadband supply through easing regulations related to network rollout in their communities (see Box 3.5).

3.2.5 Broadband building certification programmes

Governments (particularly local governments) can play a role in promoting broadband supply by certifying the broadband speeds of neighbourhoods and apartment buildings. By publishing this extra information, they may provide incentives to building developers to wire their buildings with the fastest connections available in order to lure tenants. Correspondingly, potential tenants can then use the connectivity of the building as a criterion when deciding whether to rent / buy an apartment. This has been very successful in Korea where the Government certifies new apartment buildings with 1st, 2nd, or 3rd class certificates on the building’s broadband network infrastructure depending on whether it provides over 100 Mbit, 10-100 Mbit or 10 Mbit Internet connections. Certification programmes such as these can jointly stimulate broadband supply and raise broadband awareness amongst consumers.

3.3 Innovative broadband rollouts

Conventionally, broadband rollout strategies have been aimed at establishing infrastructure to enable supply of broadband to individual consumers. This typically involves telecommunication suppliers laying cable (either copper or fibre optic) and installing equipment to enable the supply of broadband over the telephone or cable network. However, some countries have adopted more innovative approaches to broadband rollout as a way to overcome the prohibitive costs of wiring remote areas. These ideas are discussed in this section.

3.3.1 Expanding point of profitability (EPOP)

While some economies have the luxury of debating competition law for broadband, other economies are still struggling to connect areas with basic telecommunication infrastructure. Despite the hurdles, there are ways that economies can develop their networks that minimize cost and provide flexibility for future growth. One concept, called expanding point of profitability or (EPOP), proposes to build out a network incrementally as each new node becomes profitable or feasible.

First, it is important to identify a point of contact in the region to be served that has the highest probable demand for access. This could be a school, hospital, community access centre or enterprise. Once this location is connected, it becomes the anchor node for the area. Initially computers at the node can be made available to users as a community access point. Then, as demand grows in the area and equipment prices fall, the node can become the backbone connection for newer connections further away. This stresses the importance of investing in a high-capacity backbone such as fibre, when possible, to allow for future growth. This is increasingly realistic as the costs of building a new fibre or copper network are close to reaching parity.

The implications are large for governments and telecommunication providers alike. Government projects to connect all schools in a country to the Internet can effectively provide an initial backbone network capable of

reaching even very remote regions. Telecommunication providers and ISPs may then be willing to pay to branch out from these extreme nodes and provide services to residents in their homes, using various last-kilometre solutions (e.g. wireless), (see Box 3.3).

Box 3.3: Canada – Tag team broadband provision to rural communities

How Alberta plans to extend broadband to key community facilities and lease capacity to ISPs for residential access.

With its “SuperNet” initiative, the government of the Province of Alberta, Canada is planning to build a high-speed, high capacity network connecting 4,700 provincial government facilities, schools, health care facilities and libraries in 422 Alberta communities throughout the Province. What makes the Alberta SuperNet unique is that private firms can latch onto the furthest extensions of the network and offer broadband to local residents when the business case exists. The SuperNet will offer backbone connectivity to ISPs at rates benchmarked against rates in urban areas, ensuring similar broadband prices for rural and urban users.

Essentially, the project recognizes the benefit of bringing initial broadband connectivity to a community but lets the market spread out from the initial point of access. This can be an appealing strategy for governments that want to ensure communities have access without becoming last-kilometre providers.

Source: The Alberta SuperNet at <http://www.albertasupernet.ca/>

3.3.2 Use of existing infrastructure

Numerous countries have made use of existing infrastructure for broadband supply. The most obvious example is in the use of existing cable-television infrastructure to supply broadband Internet directly to the home. India is proving resourceful in making use of the existing signalling cables in its vast rail network to extend broadband access to rural areas (see Box 3.4). While the sophistication of India’s rail network is exceptional amongst developing countries, other countries might equally follow India’s lead in this regard.

Countries are also starting to make use of electrical power lines to provide broadband access. Power line communication (PLC) works by transmitting high frequency data signals through electrical power lines to businesses and residences. A special modem filters the data signal out of the electrical current while providing speeds up to 3 Mbit. Iceland and Japan are just two countries making use of the power grid to deliver broadband and PLC could help expand broadband access in developing economies as well.⁷¹

3.3.3 Community access points

As mentioned above, most countries have tended to focus their attention on the supply of broadband to individual users and businesses. An alternative that might be particularly attractive for developing economies is to promote the development and use of community centres offering broadband access, particularly in areas where it is not feasible and expensive (due to a lack of infrastructure and resources) to bring broadband to households. The approach taken by Mexico, for example, appears to be a highly successful strategy for extending broadband access to the population. There, the establishment of digital community centres has served to help extend broadband to rural and remote communities (see Box 3.4).

Community access points have also proved very successful in Korea, where the Government offers free broadband access at public administration offices. Koreans are very familiar with their neighbourhood administrative offices that, along with providing other services, hold important personal documents and listings of local residents. Typically, these neighbourhood offices install several computers on a broadband connection and allow anyone to use them free of charge (see Figure 3.2, left). The fast connections also introduce users to the benefit of high-speed Internet access, thus potentially increasing demand for high-speed home access.

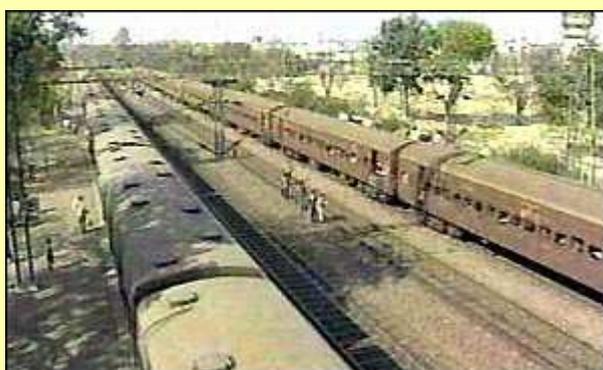
Box 3.4: Railway lines lead to broadband access in rural India

Using excess capacity on existing signalling cable in India's vast rail network to supply broadband

India's attempt in 1994 to introduce competition in fixed lines was unsuccessful once winning bidders realized their bids were too high to be profitable. As a result, India has looked for other innovative methods to expand access. One such approach has been to allow winning bidders for fixed-line services to convert their licences to wireless local loop (WLL) licences in a bid to expand the network,⁷²

One of the projects has been the use of the rail network to provide Internet access. India has one of the world's most widespread and dense rail networks with 8'000 train stations nationwide and an average distance of only eight kilometres between stations. India has found an innovative way of using this rail network to bring broadband access cheaply and quickly to its rural population.

In a plan launched in 2000, the Railroad Internet project aims to make use of roughly 65'000 kilometres of underused cable infrastructure already in place. This signalling cable (which is usually copper based, although fibre is used on several main routes) runs along the train tracks and has large amounts of spare capacity. It will be used to transmit Internet traffic to outlying areas, avoiding the time and cost of laying a fresh cable network.



Indian railways	
Track kilometers	108'706
Route kilometers	63'028
Electrified route kilometers	14'856
Number of stations	6'853
Average distance between stations, kilometers	8
Bandwidth capacity of cables, Mbit	1

Under the project, it is envisioned to set up special cybercafé kiosks (providing community Internet access as well as ticket retailing and train information) at each train station with half a dozen computers networked together and linked up to the railway cable. The speed of the connections would vary according to the quality of cable segments. The railway system would link up to the standard telephone network through high-speed digital links at major towns. In addition, there is the possibility of providing wireless Internet access within a 10-km radius of each station.

The project is being piloted in a small area first: along 40 km of railway track linking the southern towns of Vijaywada and Guntur. This initial phase of the project has been launched through cooperation between Indian Railways (state owned) and private investors (largely comprised of Internet Service Providers). There are concerns however, that the wide scale rollout of the project will be delayed by regulatory issues regarding telecommunication supply, an unsure electrical supply, and the vast bureaucratic structure of Indian Railways.

Source: Indian Railways (2001), <http://www.indianrailways.com>.
 BBC (2000). Fast track for Indian Internet, http://news.bbc.co.uk/1/hi/world/south_asia/769635.stm
 Crampton, T. (2000). Rail Network to Bring India Up to Web Speed, <http://www.whosea.org/isma/railnet.htm>.

The United Arab Emirates has extended the reach of broadband by installing Internet kiosks in public places such as shopping centres and airport lounges (see Figure 3.3, right). The kiosks are connected to the Internet with a 512 Kbit DSL line. However, unlike the community access points in Korea, the connections are not free. Users on Internet kiosks typically have much shorter surfing periods than on desktop PCs in an Internet room, though this may have the advantage of reducing queuing time.

In countries where access to broadband is provided through community centres, the use of statistics such as number of *DSL* or *cable subscribers per capita* may become less relevant in assessing the extent of broadband access in an economy. As such, new indicators may be necessary to enable meaningful comparisons of broadband uptake between economies, such as the *community connectivity indicator* proposed by Mexico at the ITU Plenipotentiary Conference held in Marrakesh, Morocco, in 2002.⁷³

Box 3.5: Digital community centres in Mexico

Computer use and Internet access in Mexico is low - estimated at about 13 per cent nationwide - and is concentrated mainly in Mexico City and other urban areas. In 2001, the Mexican Government launched a plan to provide connectivity to the general population through the establishment of Digital Community Centres, in some cases by transforming government offices such as post offices, clinics and education centres. Working in partnership with private application service providers (who supply software and training at discounted rates), the aim is to provide free high-speed Internet access to rural communities, and boost the number of Mexicans with Internet access from 4.5 million to 60 million.

In late 2002, 47 Digital Community Centres had already been established under the project, with a goal of constructing 10'000 centres by 2006. In the hamlet of Santa Ana de Allende, high in Mexico's central mountains where one phone line serves 1'400 people, the Digital Community Centre, housed in a classroom in the only secondary school there, has 18 computers and a satellite link to provide the entire community with broadband Internet access.

In this village, where daily newspapers are scarce, some residents use the computers to catch up on the latest headlines and sports. Others exchange e-mail with relatives and friends around the world. A livestock farmer even used the Digital Community Centre to buy a tractor. The site also inspired one entrepreneur to open a satellite-linked cybercafé, where residents go to read digital books not available at the local library. Students of the village make use of the Centre to pursue degrees online through a programme run by Tec de Monterrey University. This has enabled students to stay in their communities, rather than moving to urban areas or to the United States to study.

The Digital Community Centre programme is one part of a Mexican Government plan, known as e-Mexico, to develop the country's ICT industry, foster an internal market for ICT products, promote a sound regulatory framework for the use of electronic media and e-commerce, and digitise government services. Significantly, the Mexican government has recognized that while short-term goals are important to stimulate growth, the e-Mexico plan will take time and has planned on a timetable of 25 years to achieve all the targets. The plan also recognizes the fact that the promotion of Internet access, or the use of broadband, should not be a goal in itself. Rather, broadband promotion should be part of a larger scheme to make greater use of ICTs in pursuing social and economic goals.

Sources: Avila (2002). e-Mexico Project Overview: Telecom Trends Mexico 2003. U.S. Embassy in Mexico City. <http://telecom.ita.doc.gov/>; <http://www.siliconvalley.com/mld/siliconvalley/news/editorial/3435611.htm>

Figure 3.3 Public access to broadband

(Left) Internet room in neighbourhood government office in Mokpo, Republic of Korea. (Right) Internet kiosk in the United Arab Emirates.



Source: Author's photo (left), <http://www.emirates.net.ae/isp/channel/kiosk/> (right)

3.3.4 Wireless broadband

Wireless broadband technology is developing rapidly and has the potential to overcome the difficulties in supplying broadband over the last kilometre to consumers, or reaching areas out of the reach of traditional landline networks. It is also particularly appropriate for community access schemes. Despite the tremendous hype, some telecommunication suppliers have found investment in wireless broadband to be unprofitable.⁷⁴ Yet, Lanka Bell, in Sri Lanka has achieved success in 2002 by offering broadband over their fixed wireless local loop.⁷⁵ In this way, Lanka Bell has offered broadband to businesses and households that do not have access to other types of broadband due to geographical difficulties and a general lack of other infrastructure. Lanka Bell's BellBurst service offers speeds from 64 Kbit to 2 Mbit. In October 2002, Lanka Bell had 40 subscribers, and a plan to reach 100 by the end of 2002.⁷⁶ Spain and Hong Kong, China, have also made extensive use of wireless technologies to increase the size of their broadband networks. Spain's experience is described in Box 3.6.

Box 3.6: Spain's "Hot City"

Zamora, Spain is the world's first city to have wireless broadband access available to all citizens.

As a tourist destination, Spain already has claim to several hot cities during the winter months in Europe. However, Zamora, Spain (population 68,000) claims to be the first city with ubiquitous WiFi access, giving it its "hot city" moniker. Wireless broadband provider Wireless and Satellite Networks (WSN) joined forces with Intel to connect the entire city with 802.11b (WiFi) hotspots that provide unlimited access for around US\$ 9 a month.

The town's wireless infrastructure consists of 200 access points placed strategically around the city, each fulfilling two functions. First the access point enables connections with wireless users in its vicinity. Second, simultaneous connection is enabled to other nearby access points to form part of a mesh-type network around the city. The service has been so successful that Intel and WSN plan to deploy similar networks in another 200 cities.

Source: Intel press release: <http://www.intel.com/ebusiness/pdf/affiliates/Zamora0243.pdf>
Circuit for Employees at Intel: <http://www.mtnds.com/nb/intelcorporatemagazine.htm>

In summary, successful economies have strong competition both within technologies and among different broadband technologies. Regulators must constantly monitor the market to ensure it remains competitive and efficient. It is also important to remove market inhibitors such as cross-ownership to ensure efficient broadband development.

Successful economies make broadband a priority through local, regional and national initiatives. They can stimulate broadband supply by offering tax credits, favourable loans and subsidies. In addition, some economies can most effectively make use of non-traditional infrastructures that could be used to carry broadband. This is particularly important until new, faster networks can be installed. Finally, economies can extend Internet access to schools, hospitals and community access centres that can then become anchors for expanded network development in the future.

4 Conclusion

This focus of this paper has been on ideas and strategies for promoting broadband. While it is clear that there are no universal rules that apply to all economies equally, this paper has attempted to highlight a diverse set of strategies for promoting broadband that have been applied successfully in a diverse set of countries. The aim has been to offer a toolkit of alternatives from strategies that have been used around the world.

For the most part, this paper has taken it for granted that broadband promotion is a good thing. While countries such as Korea, Canada, Iceland, Japan, and Hong Kong, China seem to be realising the benefits of large-scale take-up of broadband, it remains to be seen whether real, rather than merely potential, benefits of broadband will be realised universally. Furthermore, this paper has generally not addressed possible drawbacks of broadband and negative social impacts of its use. Importantly, it is felt that efforts to promote broadband should not be followed single-mindedly, but that the full social implications of broadband use, industry convergence, and policy changes should be carefully considered.

The term "broadband" is also very much a moving target. While the broadband of today consists of, for the most part, cable modem and DSL connections, the broadband of the future may very well be based on fibre-optic cable or wireless technologies. The implications of this for those actively promoting cable and DSL may be highly significant. Will promoting the broadband of today serve as a necessary stepping-stone for the adoption of future broadband technologies? Will those countries that have low take-up of broadband today

lose out on the advantages of a widespread rollout and fall too far behind to catch up? On the other hand, could money spent promoting cable and DSL be better spent investing in a more fundamental rebuilding of the network infrastructure? Will countries currently promoting copper lose out to countries like Sweden, Iceland and Japan that have focused on fibre-optic networks in the long term? For those developing countries without broadband, what technology should they invest in now?

Strategies and policies to promote broadband will prove most successful when they do not operate in isolation. Rather, broadband promotion is likely to be most effective when various initiatives and projects are integrated, encompassing all stakeholder groups. Experience has shown that broadband has the potential to impact on a number of different fields, such as health care, education and entertainment, and accordingly, efforts to promote broadband should be closely tied with initiatives in these fields.

Finally, in addition to infrastructure, policy and access issues, one of the key concerns for those interested in promoting broadband should be to give users a foretaste of the technology. As they recognize the benefits, demand for broadband will be driven upwards, stimulating the market and ensuring future social and economic rewards of this new technology.

5 Broadband statistics

Table 5.1: Broadband subscribers

Country	Total Broadband Subscribers (2002)	Broadband Subscribers per 100 inhab (2002)	Country	Total Broadband Subscribers (2002)	Broadband Subscribers per 100 inhab (2002)
Argentina	115'000	0.3	Luxembourg	1'215	0.3
Australia	122'800	0.6	Macao, China	16'954	3.9
Austria	539'500	6.6	Malaysia	4'000	0.0
Bahrain	1'566	0.2	Mexico	50'000	0.0
Belgium	870'000	8.4	Netherlands	1'059'602	6.5
Brazil	331'000	0.2	New Caledonia	132	0.1
Canada	3'600'000	11.5	New Zealand	17'267	0.4
Chile	59'975	0.4	Norway	88'541	1.9
China	203'000	0.0	Peru	34'282	0.1
Cyprus	7'000	1.0	Philippines	100,000	0.1
Czech Republic	6'200	0.1	Poland	12'000	0.0
Denmark	462'000	8.6	Portugal	259'491	2.5
Estonia	32'000	2.4	Romania	6'000	0.0
Finland	273'500	5.3	Russia	5'000	0.0
France	1'456'000	2.4	Saudi Arabia	1'000	0.0
Germany	3'130'000	3.8	Singapore	230'357	5.5
Guam	1'750	1.1	Slovenia	5'500	0.3
Hong Kong, China	989'115	14.6	Spain	224'180	0.6
Hungary	52'506	0.5	St. Vincent	81	0.1
Iceland	25'000	8.7	Sweden	700'000	7.8
India	50'000	0.0	Switzerland	455'000	6.3
Indonesia	15'000	0.0	Taiwan, China	1'825'000	8.1
Iran (I.R.)	661	0.0	Thailand	1'613	0.0
Ireland	7'562	0.2	Turkey	2'818	0.0
Israel	40'000	0.6	United Arab Emirates	9'320	0.3
Italy	390'000	0.7	United Kingdom	1'360'000	2.3
Japan	7'805'917	6.1	United States	18'700'000	6.5
Jordan	1'730	0.0	Uruguay	1'371	0.0
Korea (Rep.)	9'864'620	21.3	Venezuela	31'976	0.1
Latvia	3'235	0.1	Total	55'047'337	0.01

Note: Values in italics are either 2000 or 2001 data and represent the most recent observation. The economies not shown either have no broadband or have not reported their data.

Source: ITU World Telecommunication Indicators Database.

- ¹ A kilobit is one thousand bits. 1 kbit/s means 1'000 (i.e. 10^3) bits of information are transmitted each second. A megabit is one million bits. 1 Mbit/s means 1'000'000 (i.e. 10^6) bits of information are transmitted each second. A gigabit is one billion bits. 1 Gbit/s means 1'000'000'000 (i.e. 10^9) bits of information are transmitted each second.
- ² Holsendolph (2001). "A US city decided to provide its residents with a year of free Internet Access. But only half have signed on: Why LaGrange isn't more 'wired'." *Atlanta Journal & Constitution*. 2 September 2001.
- ³ While LaGrange had difficulty signing users up for free Internet service, it has won awards for being one of the top "intelligent communities" in the world. See <http://www.intelligentcommunity.org/art/PDFs/TopSevenIC2002.PDF> for information about the award and <http://www.lagrange-ga.org> for the town's website.
- ⁴ "Always-on" means a user has continuous access. This can be contrasted with standard dial-up Internet connections with which it is necessary to engage a new connection each time access is required.
- ⁵ The total time savings resulting from use of broadband are most dramatic for people with heavy data requirements. Thus, data-intensive users save proportionately more time than casual e-mail senders or instant messaging users.
- ⁶ http://www.broadbanduk.org/news/bsg_news_19_11_02.htm
- ⁷ Swisscom's press release can be found at "http://www.swisscom.com/pr/content/public/schulenansinternet2/index_EN.html"
- ⁸ See <http://www.businessconnect.org.uk/index.cfm/Region> and <http://news.bbc.co.uk/1/hi/wales/2368419.stm> (March 10, 2003) for more information.
- ⁹ See for example, Manchester United Football Club's subscription only content at <http://www.manutd.co.uk>, and Nebraska Athletics website at <http://www.huskersonside.com>.
- ¹⁰ Provisions prohibiting users from sharing their Internet connections are common among cable broadband providers due to the very nature of the cable network. This is not the case with DSL where each subscriber is allocated a certain bandwidth over a dedicated line. Thus in theory, it should make no difference to DSL providers how many users share a connection as the bandwidth available on that line is fixed.
- ¹¹ However, the predominance of SPAM (junk e-mail) and the tendency for SPAM to increase the longer an e-mail address is used means that there are advantages to changing e-mail addresses periodically.
- ¹² The e-mail plan is outlined in Dublin's Economic, Cultural and Social Strategy 2002-2012, available at http://www.dublin.ie/Strategy_per cent202012.asp
- ¹³ See the Korean case study at http://www.itu.int/ITU-D/ict/cs/korea/material/CS_KOR.pdf
- ¹⁴ In 2001, the ITU published "ITU Internet Reports: IP telephony" that examines technical, economic, regulatory and practical aspects of IP telephony. It is available from the ITU at: <http://www.itu.int/ITU-D/ict/publications/inet/2000/>
- ¹⁵ See http://bbpromo.yahoo.co.jp/promotion/tour/bb_phone.html for more information.
- ¹⁶ YahooBB had 1.97 million subscribers in January 2003, of which 1.59 million were YahooBB Phone users.
- ¹⁷ Japanese call prices were current as of February, 23, 2003. YahooBB phone rates outside the network are 7.5 Yen for a three-minute call while NTT charges up to 80 Yen for the same call.
- ¹⁸ See <http://www.vonage.com> for more details.
- ¹⁹ One possible example is voice-operated browsers. See <http://www.w3.org/voice> for more details.
- ²⁰ The Hong Kong, China case study is available online at http://www.itu.int/ITU-D/ict/cs/hongkong/material/CS_HKG.pdf
- ²¹ Traditional cable and broadcast video signals send out all available channels to every subscribing home, even though the household can only normally watch one channel at a time. Video over broadband has the possibility to change that. Instead of streaming all video signals to each home, broadband video users are able to select individual programs to have streamed to their television. Broadband video users also have the ability to control the programs with rewind, pause, and fast-forward function, in addition to being able to watch any program at any time.
- ²² In 2002, worldwide CD sales fell 9 per cent from the year before, with sales expected to fall an additional 8 per cent during 2003. Many are using the figures to point out how pirated music over broadband is killing the music industry. See <http://www.activedayton.com/ddn/life/daily/0304cdsales.html>, March 04, 2003. Others dispute the findings and claim the reason sales are down is because the music industry released 20 per cent fewer new releases in 2002 than in 1999. In addition, CDs are also declining in popularity due to the rise of DVD audio an alternative format. See BusinessWeek article "Big Music's Broken Record," http://biz.yahoo.com/bizwk/030213/tc200302139095_tc078_1.html, February 13, 2003.
- ²³ In addition to simply playing games against each other, Xbox users don a headset and actually can speak to all other player in the game. See "The Mixed Joys of Online Gaming", March 14, 2003, <http://www.msnbc.com/news/884272.asp?0cv=TA01&cp1=1>

- ²⁴ The Japanese case study is available at <http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/japan.pdf>
- ²⁵ <http://www.us.playstation.com/news/PressReleases/415014843.asp> and <http://www.microsoft.com/presspass/press/2002/jan02/01-08SuccessfulLaunchPR.asp>
- ²⁶ Online gamer's passion isn't just for bandwidth. They will pay real money for the best characters they can buy. Ebay eventually had to end the buying and selling of EverQuest characters because merchandizing online items goes against Everquest's acceptable use policy (AUP). At one point, well-fitted characters were selling for \$1000. See <http://www.cdmag.com/articles/031/079/news010119-05.html>
- ²⁷ The Icelandic case study is available online at <http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/iceland.pdf>.
- ²⁸ Alvin Toffler ("Future Shock", Bantam Books, 1984) gives an interesting perspective on the inefficiency of commuting to work every day. He says, "In a country [the United States of America] that has been moaning about low productivity and searching for new ways to increase it, the single most anti-productive thing we can do is ship millions of workers back and forth across the landscape every morning and evening."
- ²⁹ One of the main security elements for telecommuting is a virtual private networks (VPN). A VPN is an encrypted connection to a server at work, enabling a broadband connection to function exactly as an extended network connection from work.
- ³⁰ <http://www.cisco.com/warp/public/779/smbiz/netsolutions/find/telecommuting/p24.html>.
- ³¹ http://www.cisco.com/en/US/netsol/ns110/ns5/ns6/ns122/net_value_proposition09186a00800a3395.html.
- ³² For more information, see http://www.greenbiz.com/reference/government_record.cfm?LinkAdvID=21573.
- ³³ See <http://www.siemensenterprise.com/attachments/company/teleworking.pdf> for more information.
- ³⁴ Highlights of the report are available from Ekos Research at http://www.ekos.ca/admin/press_releases/telework4.pdf
- ³⁵ For more information, see http://asia.internet.com/asia-news/article/0.,161_869671,00.html and the Vietnamese Ministry of Trade site at http://www.mot.gov.vn/index_en.htm.
- ³⁶ EDI is the electronic exchange of structured business documents in a standardized format between computer applications of trading partners.
- ³⁷ Web content by language data is from the Global Research Institute
- ³⁸ See <http://www.canarie.ca/about/about.html> for more information
- ³⁹ See ITU Visions presentation by Sean O'Siochru and Bruce Girard on "Information wants to be free" at <http://www.itu.int/osg/spu/visions/Conference/osiuchru.pdf>.
- ⁴⁰ See the Malaysian case study from the previous ITU broadband workshop at <http://www.itu.int/osg/spu/ni/broadband/workshop/malaysiafinal.pdf>.
- ⁴¹ See <http://www.citywest.ie/> for more information.
- ⁴² See <http://dmc.seoul.go.kr/english/>.
- ⁴³ http://afrinet.intnet.mu/competition/competition/2001/jkc1/cyber_island/whatisit.htm.
- ⁴⁴ The hoax claims that users must delete a legitimate Windows file on their computer in order to protect against mass unauthorized e-mailings from their computer. Users around the world have deleted the harmless file in an attempt to "protect" their computers. The hoax is explained at <http://www.symantec.com/avcenter/venv/data/jdbgmgr.exe.file.hoax.html>
- ⁴⁵ Firewalls are one effective way to prevent unauthorized access to personal resources on a computer with broadband access. Many firewall providers offer free versions of their software for download on the web, such as www.tinysoftware.com and www.zonelabs.com.
- ⁴⁶ Firewalls require that all Internet traffic travel through software or a piece of hardware that decides whether to allow it to pass. The difficulty in configuring a firewall is deciding what traffic to allow and what traffic to deny.
- ⁴⁷ See <http://www.earthlink.net/home/broadband/homenetwork/gettingstarted/firewall/>
- ⁴⁸ India: The Information Technology Act, 2000 (No 21 of 2000) at <http://www.laws4india.com/cyberlaws/act.asp>
- ⁴⁹ This discussion is drawn from a presentation given by Clair Milne, Antelope Consulting, at the ITU World Indicators Meeting, Geneva, January 13-15, 2003 < http://www.itu.int/ITU-D/ict/WICT02/doc/pdf/Doc30_E.pdf >
- ⁵⁰ See http://www.oftel.gov.uk/publications/about_oftel/2002/manp1202.htm#sum more information.
- ⁵¹ The Icelandic case study is online at <http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/iceland.pdf>
- ⁵² See <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2002/12/10/BU110795.DTL> , Dec 10, 2002.

- ⁵³ The cost is 1'450 Japanese Yen per month through the ISP TikiTiki. Prices valid March 17, 2003
- ⁵⁴ Swisscom Press Release, "Swisscom Mobile Launches Public Wireless LAN", November 27, 2002
- ⁵⁵ See the ITU New Initiatives Workshop on Competition Policy in Telecommunications at <http://www.itu.int/competition>.
- ⁵⁶ The Korean case study is available online at http://www.itu.int/ITU-D/ict/cs/korea/material/CS_KOR.pdf.
- ⁵⁷ The Japanese case study is available online at <http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/japan.pdf>.
- ⁵⁸ See Federal Communications Commission (FCC), Notice of Proposed Rulemaking, Appropriate Framework for Broadband Access to the Internet over Wireline Facilities (FCC 02-42, Released: 15 February 2002), FCC Notice of Proposed Rulemaking, Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services (FCC 01-360, Released: 20 December 2001), and FCC, Declaratory Ruling and Notice of Proposed Rulemaking, Inquiry Concerning High-speed Access to the Internet Over Cable and Other Facilities; Internet over cable declaratory ruling; Appropriate Regulatory Treatment for Broadband Access to the Internet Over Cable facilities (FCC 02-77, Released 15 march 2002).
- ⁵⁹ OECD, "The Development of Broadband Access in OECD Countries", 2001, pg 19, available at <http://www.oecd.org/pdf/M00020000/M00020255.pdf>
- ⁶⁰ A look at other OECD telecommunication performance benchmarks sees that usually at least one Nordic country is in the top six for new communications service adoption.
- ⁶¹ European Commission, "XXIXth Report on Competition Policy 1999", 1999, pg 37. Also available at http://europa.eu.int/comm/competition/annual_reports/1999/en.pdf.
- ⁶² See "International Public Programs to Provide Broadband Access to the Internet," http://broadband.gc.ca/english/resources/inter_summ_jan05.pdf
- ⁶³ See the State of Michigan's website at <http://www.michigan.gov/emi/1,1303,7-102--20290--,00.html> for more information.
- ⁶⁴ See "<http://www.rabbit-broadband.org.uk>"
- ⁶⁵ http://www.broadbanduk.org/reports/BSG_Second_Annual_Report.pdf
- ⁶⁶ <http://209.217.86.48/MLISTS/news2002/0063.html>
- ⁶⁷ See the Stokab website at <http://www.stokab.se>
- ⁶⁸ See the Sollentuna Energi website at <http://www.sollentunaenergi.se>
- ⁶⁹ <http://www.kenniswijk.nl>
- ⁷⁰ See the Canadian case study online at <http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/canada.pdf>.
- ⁷¹ One problem is the data cannot travel through a transformer so each connection must somehow connect to the nearest transformer. However, this can be accomplished easily through wireless solutions.
- ⁷² See the Indian case study prepared for the ITU workshop on Competition Policy in Telecommunications at <http://www.itu.int/osg/spu/ni/competition/casestudies/india/India%20case%20study%202.pdf>.
- ⁷³ The text proposing the indicator is available at http://www.itu.int/ITU-D/ict/WICT02/doc/pdf/Doc06_E.pdf
- ⁷⁴ As examples, fixed wireless broadband supplier, Teligent, in the United States was declared bankrupt for the period from May 2001 to September 2002, and a competitor, Winstar, was declared bankrupt in early 2001.
- ⁷⁵ <http://www.lankabell.net/pressreleases.htm>
- ⁷⁶ See <http://www.lankabell.net/pressreleases.htm#Launches> for more information. Current as of March 20, 2003.