ITU WORKSHOP ON UBIQUITOUS NETWORK SOCIETIES

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UBIQUITOUS NETWORK SOCIETIES:

THE CASE OF THE REPUBLIC OF KOREA

© ITU April 2005 This updated case study has been prepared by Taylor Reynolds (taylor.reynolds@oecd.org), Tim Kelly (tim.kelly@itu.int) and Jeong Jin-Kyu (jkjeongitu@hanmail.net), for the Strategy and Policy Unit (SPU) of the International Telecommunication Union (ITU). This Korean case study was originally prepared for the March 2004 workshop on Shaping the Future Mobile Information Society and has now been updated and revised. It has been updated for the ITU New Initiatives Workshop on Ubiquitous Network Societies, Geneva 6-8 April 2005 and the WSIS Thematic Meeting "Towards the realisation of the ubiquitous network society", organised by MIC Japan, ITU and UNU, in Tokyo, 16-17 May 2005.

This report is part of a series of telecommunication case studies produced under the ITU New Initiatives Programme. The ubiquitous network societies case studies programme is managed by Lara Srivastava (lara.Srivastava@itu.int), under the direction of Tim Kelly (tim.kelly@itu.int). The series is edited by Neil Livingstone (neil.livingstone@itu.int). Other country case studies in this series include Italy, Japan and Singapore. All materials relating to this case study and the workshop in general can be found at http://www.itu.int/ubiquitous.

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1 Introduction

The concept of a "ubiquitous network society" implies a world in which information, and the tools to exploit it, are available "anytime, anywhere, by anything and anyone". A ubiquitous network society is thus the logical, long-term outcome of the drive to create Information Societies, as espoused by the World Summit on the Information Society (Geneva 2003 and Tunis 2005).

The Republic of Korea is an appropriate place in which to study ubiquitous network societies. As the twenty-first century gets under way, the Republic of Korea has found itself at the cutting



edge of the information revolution. Koreans are taking uncharted steps into a life surrounded by information. For many Koreans, lifestyles already revolve around high-speed information access. Koreans can access information easily from state of the art mobile networks and handsets, the world's most extensive broadband network, or from 25,000 cybercafés located around the country. For younger generations especially, being Korean means being connected.

However, this is just the beginning. Korea's vision of a "ubiquitous dreamworld" (see Box 1.1) is set to continue to change the way that Koreans access and use information. This new "unified" network promises to change Korea's information society, drastically increasing the amount of information Koreans can access at any time.

Korea provides an excellent example for a study of the mobile information society, simply because its success as one of the world leaders in information and communication technologies is little short of phenomenal. The country has evolved from utter decimation at the end of the Korean War to being one of the world's most high-tech economies. Korea has the highest level of broadband penetration in the world; more than 70 per cent of households are connected to the Internet via high-speed lines. Korea is also one of the leaders in mobile phone technologies. It was among the first countries in the world to offer IMT-2000 (or 3G) services.

Box 1.1: What is the ubiquitous network society?

Korea's vision of a Ubiquitous Dreamworld

As the different background papers and case studies prepared for ITU's New Initiatives Workshop on Ubiquitous Network Societies show, the concepts and definitions of what constitutes "ubiquitous" vary between countries, and between different disciplines; sometimes subtly, sometimes significantly. Korea's own short-hand definition of ubiquitous is "Anytime, anywhere, any device, any service, all security". From the Latin root, Korea defines the concept as meaning 'existing everywhere' or 'existing everywhere and all the time, simultaneously. It refers to an environment that anybody can use at anytime, anywhere through computers and network. In such an environment, the transition from wired to wireless networks is seamless.

1.1 About the report

This analysis forms part of the background research for the Ubiquitous Network Society workshop, held in Geneva, Switzerland in April 2005. It was updated and revised from an earlier study carried out in 2004. The Korean case study is just one of four case studies that will explore the nature of the ubiquitous network society. The other three case studies cover Italy, Japan, and Singapore. In addition, thematic background papers look at the impact of the Ubiquitous Network Society on the traditional telecommunication industry, its implications for consumer privacy and a case study of radio frequency identification (RFID).

This ITU New Initiatives workshop serves as a forum for telecommunication policy makers, national regulators, private sector participants, and academics to discuss the implications of a mobile information society. This particular workshop is intended also to provide input for the Thematic Meeting of the World Summit on the Information Society (WSIS) on "Towards the realisation of the ubiquitous network society",

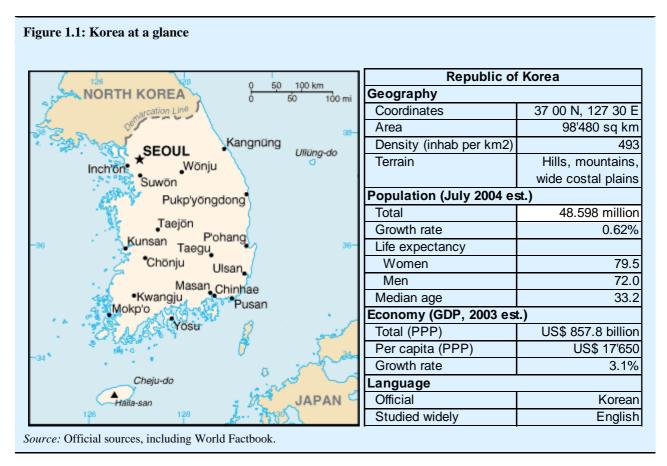
to be organised by MIC Japan, ITU and United Nations University (UNU) in Tokyo, Japan, 16-17 May 2005.

The study is broken into seven sections. Section two introduces broadband in Korea, with information on network deployment, growth in services, and regulatory trends. Section three studies the backdrop to the mobile market with an overview of growth and development, network infrastructure, and government policy. Section four describes current-day mobile services, the evolution of terminals and mobile culture. Section five pulls together the elements of sections two to four to explore the Korean vision of a converged network. It will discuss the blurring of the line between broadband and mobile, how these networks will interact, future end-user services, and the complicated market implications of a converged network. Section six takes the technical and user-focused elements of section four and puts them in the context of the Korean information society. It will look at social factors of the Korean information society, including the benefits and drawbacks of being connected anywhere, anytime. Section six also looks at measures to protect data, and to help users manage mobile information. Section seven, the conclusion, looks at which elements of the Korean experience can be extrapolated to the world, and which may be unique to the peninsula.

1.2 Country profile

1.2.1 Physical characteristics

The Republic of Korea is on a peninsula that lies between China to the West, Japan to the East, and the Democratic People's Republic of Korea to the North (also commonly known as North Korea). The Republic of Korea's only land border is to the North along the 38th parallel. Its land mass is 99,000 square kilometres, making it slightly smaller than Cuba, Iceland, and Guatemala and slightly larger than Hungary, Portugal and Jordan. Korea's population in 2002 was 48.2 million with a population density of 490 inhabitants per square kilometre (see Figure 1.1).



1.2.2 Social characteristics

The past 100 years have been turbulent for the Korean peninsula but the country has proven tenacious, rebuilding the economy from virtual decimation to attain the leading role it has today in the information society. The Korean peninsula was annexed by Japan for 35 years in 1910 as a Japanese colony, until the

autonomy of Korea was regained in 1945 at the end of World War II. The peninsula was then divided into two sections, the north backed by the former USSR and the south backed by the United States. The Korean War broke out in 1950 and lasted until a cease-fire was signed in 1953, leaving the country in utter ruins. In 50 years, Korea has rebuilt its county and economy to the 16th largest in the world, despite being only the 26th largest in terms of population.

This economic growth has been described as "phenomenal" and "a miracle" due to the movement from one extreme level to another. In 1960, Korea had a per capita income of less then US\$ 100. However, during the next forty years, Korea's average annual growth rate was 8 per cent, growing the economy to reach a per capita income of US\$ 17'800 (based on purchasing power parities), pushing Korea into the World Bank classification of a high-income economy.

"Bballi Bballi"

While the "Korean miracle" has been the topic of much study in the academic press, Koreans would be quick to explain that Korea's phenomenal success can be summed up by the simple Korean phrase, "bballi bballi", literally "hurry hurry". Korea's moniker "Land of the morning calm" gives a misleading impression. Koreans work extremely hard and have sacrificed to develop into a high-income country in a mere 50 years. This bballi mentality permeates through all aspects of Korean life, including telecommunications. Koreans work extremely long hours and have one of the longest working weeks (5.5 days) in the industrialized world. Koreans will not be content and relax, u they become the leading IT economy in the entire world, it seems. If their growth in the past can be an indication, they are certainly on the right track.

1.3 Historical perspective

Korea's telecommunication history began in August 1885 when a telegraph line was installed between Seoul and Incheon. The first telephone lines were installed in 1902 and the first automatic exchange introduced in 1935. Korea joined the International Telecommunication Union (ITU) in 1952. By the end of the 1980s, Korea had achieved virtually achieved universal service. Korea signed the World Trade Organization (WTO) Agreement on Basic Telecommunication Services that became effective in November 1997, committing the country to further liberalization of its telecommunication sector.

The nation's historical operator is Korea Telecom Corporation (KT). It began as the government-owned Korea Telecom Authority. Its statute was changed in 1989 allowing it to be privatized, and in November 1993 the Government began selling its shares in the company. Ten additional share sales ensued over the next decade with the final one in May 2002, just ahead of the World Cup, when the Government fully divested itself of the company.

Box 1.2: Korea's wise investment in information promotion

How revenues from spectrum licences and taxes on operators are re-invested in telecommunications

Spectrum auctions and licences have been very successful around the world at swelling the coffers of governments. However, these funds are usually put into the Government's general budget and used to fund non-telecommunication related projects. The Korean Government recognized early on that these funds could be strategically reinvested in the telecommunications sector as a way to help Korea become a world leader in ICTs. The fees from spectrum licences were pooled together into a government fund called the "Information Promotion Fund".

In addition to one-time deposits from spectrum auctions, the Government keeps a steady flow of new money flowing into the fund by requiring operators to pay a fee that amounts to 0.8 per cent of their revenue into the fund.

The fund, in total, holds around US\$ 5 billion and disperses around US\$ 500 million each year on projects to help encourage access to information. The research projects fall into three main categories:

- 1. Upgrading infrastructure;
- 2. Pioneering research (ETRI, NCA, IITA)
- 3. Building and maintaining internal government networks.

These investments have produced phenomenal results in Korea, including establishing its position as the world's broadband leader. The Korean example shows how careful use of spectrum fees can help boost overall connectivity in the society, to the benefit of the industry rather than as a tax upon it.

Source: NCA.

The Ministry of Information and Communications (MIC) is responsible for telecommunications and broadcasting policy and regulation. This mandate also extends to certain areas of information technology. The MIC is active in promoting and developing the communication industry in Korea. One tool it has had at its disposal is requiring telecommunication operators to contribute to government programmes for industry development. In contrast to many other countries, this money and funds from spectrum auctions are then reinvested in the telecommunication sector instead of being transferred to other areas of government (see Box 1.2).

1.3.1 Developing the backbone

Korea's telecommunications success is partially attributable to the Government successfully targeting key industries. In 1993, the Office of Information Planning identified a nationwide fibre backbone as vital for Korea's economic development. Rather than funding the backbone completely, the Government put up grant money and then agreed to become a tenant on the line, so as to ensure sufficient demand. The backbone was the first national, high-speed backbone of its kind throughout the world. While other economies had used public funds to develop backbone networks between universities (e.g. the United States High-Performance Computer Network Initiative or the European Union's TEN project), Korea was the first to target government offices around the country as the landing spots for the connections.

The rollout for the 10-year plan was assigned to KT and Dacom, which built the fibre ATM backbone that now spans the country. The Government continues to lease lines on the fibre that connect government offices such as post offices and provincial headquarters. Post offices around the country are connected via the secure fibre backbone and users are able to send and receive funds securely. Postal accounts make up 25 per cent of bank accounts throughout the country.

The Government's initial investment of US\$ 1 billion has paid off with the private sector completing the rest of the network at a total expense of US\$ 50 billion. The Korean experience has shown that the government can play a key role in network provision by becoming an anchor tenant on the line, a strategy being used by other leading broadband economies, such as Canada.

1.3.2 Educating users

In addition, some of Korea's current success in telecommunications can be tied to a government project that trained people in IT skills. In total, over 10 million people were given IT training and have subsequently become more savvy technology users and buyers (see Box 1.3).

Box 1.3: Educating out of the Asian financial crisis

How widespread ICT education has helped fuel Korea's growth

The Asian financial crisis, in 1997-98, was particularly difficult for the Republic of Korea. The value of the Korean Won dropped substantially and Korea was forced to request financial assistance from the International Monetary Fund (IMF). However, the crisis was also a turning point for the Information Society in Korea.

In response to the crisis and the IMF conditions for aid, many Koreans lost their employment during restructuring. The Korean Government decided to create a programme that would give these unemployed people IT training. At the time, the Government decided it would create a programme that would give IT training to 200'000 women outside the workforce. However, the demand for the programme far exceeded the Government's expectations. Three million women applied for the programme, which was eventually extended to include IT training for men. Post offices and vocational institutions were opened for free IT classes. In total, over 10 million people—roughly a quarter of the Korean population—received IT training by way of government programmes or institutes with government certification.

The effort produced astonishing results. Koreans who went through the training are much more likely to participate in the information economy. They are more prone to be Internet users, subscribe to broadband, use the mobile Internet on their phone, and shop online.

Source: Former MIC Minister Yang Seung-taik.

1.4 ICT Statistics

Some of Korea's impressive ICT statistics are given in Figure 1.2. Mobile phone penetration overtook fixed-lines as long ago as 1999 and in 2003, for the first time, fixed lines actually began to decline. Korea is now in the unusual situation, almost unique in the world, of having more Internet users and PCs than fixed telephone lines. The mobile phone population continues to grow, adding a further 1.25 million users during 2003. Broadband also continues its expansion with a further one million broadband users being added in 2003. A dramatic example of the expanded use of increasingly higher bandwidth services is the fact that Korea's international Internet bandwidth more than doubled during 2003, suggesting a return to growth rates not witnessed elsewhere since the dot.com bubble burst. Sections two and three will examine both the broadband and mobile markets in more detail.

Figure 1.2: Korea's ICT statistics

A snapshot of the ICT industry in Korea

Republic of Korea (2003)			
Mobile Telephones			
Penetration rate	69.12		
Total	33'591'760		
Growth Rate, 00-03	7.80%		
Fixed Lines			
Penetration rate	47.07		
Total	22'877'020		
Growth rate. '00-03	1.42%		

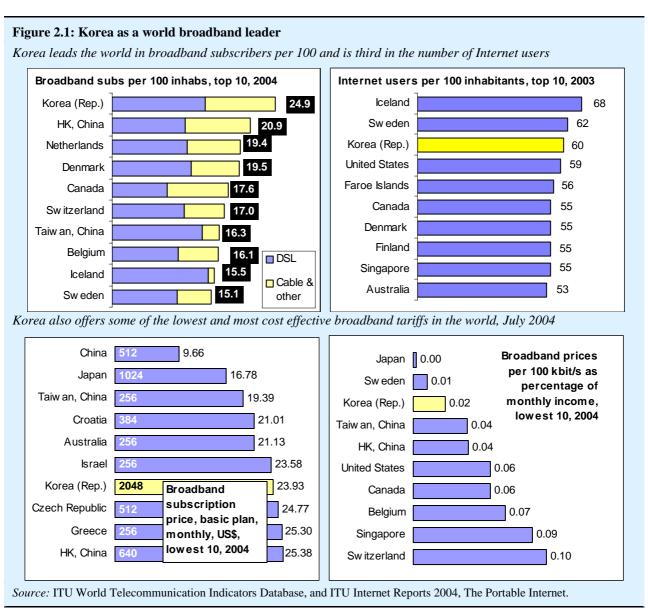
Republic of Korea (2003)			
Internet			
Users	29'220'000		
Users per 100	60.13		
Intl. bandwidth (Mbps)	37'069		
PCs	26'741'000		
Broadband			
Total subscribers	11'179'121		
Subs per 100 inhab	23.0		

Source: ITU World Telecommunication Indicators Database.

2 Broadband

2.1 Level of network deployment

Korea is the world's broadband leader by a large margin. In 2004, Korea had 24.9 broadband subscribers per 100 inhabitants (see Figure 2.1, upper charts). This equates to more than three-quarters of all households subscribed to broadband.² In addition to the world's highest broadband penetration rate, Koreans have some of the cheapest and fastest residential connections in the world at the lowest prices. ADSL broadband connections at 2 Mbit/s are on offer at less than US\$25 per month while even VDSL broadband connections, at 20-40 Mbit/s, cost consumers less than US\$50 a month (see Figure 2.1, lower charts). This extraordinary position is the result of several key factors, especially the level of competition, government involvement and geography.



Broadband Internet services were launched in Korea in July 1998 by the cable provider Thrunet. In April 1999, Hanaro entered the broadband market by offering the world's first ADSL service. Hanaro had been a competitive fixed line telephony provider but ran into several obstacles in extending its market share against the incumbent, KT. There was no number portability at the time and users going back to KT from Hanaro were forced to pay large reconnection fees. Facing these fixed line problems, Hanaro changed its strategy from a focus on fixed-line telephony to broadband. This strategic move was particularly successful given KT's reluctance to deploy ADSL due to its high investment in IDSN. However, when the success of the ADSL service became apparent, KT quickly responded and began offering its own service in June 1999.³

In 2005, the broadband networks in Korea are extensive and most households have access to two or more technologies to subscribe to broadband. ADSL is available to 90 per cent of homes with cable television networks passing around 60 per cent of households. In addition to these core technologies, Koreans often also have access to apartment LAN technology (essentially Ethernet wiring in the building connected to the ISP via fibre), wireless local loop, and satellite connections — each of which have extensive coverage.

Currently VDSL speeds of 20-40 Mbit/s are available to many Koreans at just under US\$ 50 a month with average speeds in the country at 4 Mbit/s. However, the Government plans on having 20 Mbit/s connections available to all homes by 2006. The speed is important because it represents the speed necessary to view high-quality HDTV signals. The 20 Mbit/s speeds are only a starting point for Korea's broadband vision. In the near future, VDSL speeds are expected to reach 50+ Mbit/s. Hybrid fibre/coax connections will be able to reach 30 Mbit/s. By 2010, Korea plans to have between 50-100 Mbit/s available to all homes. These goals may seem optimistic but may very well become a reality given the tremendous growth of Korean broadband that has taken place in the space of just over five years. One implication is that, despite the continuing improvement in performance and capacity of mobile communications networks, fixed line networks may continue to have the edge for some years to come.

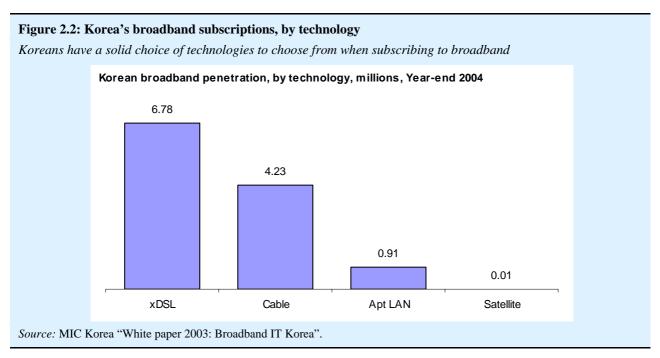
2.1.1 How has Korea achieved this success?

Korea's exceptional broadband success is due to several factors, some of which may be specific to Korea and others that can be replicated by policy-makers in other economies. Each of the key factors—competition, government involvement, and geography—are discussed below.

2.1.2 Competition

Korea's competitive situation will play a major role in helping the Government reach its ambitious goals for universal, high-speed broadband access. While many countries have competition at the level of services providers, Korea is one of the few that also have real competition at the infrastructure level too. Koreans can choose among multiple providers on each technology and there are multiple technologies available to most homes. In addition, Korea has one of the world's only examples of true facilities-based competition, a situation where side-by-side networks compete against each other using the same technology.

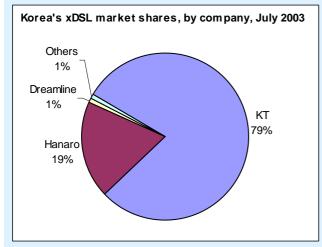
Currently, Koreans have many technology options for broadband in most areas of the country. The most popular connection technology is xDSL (different flavours of Digital Subscriber Line), accounting for 57 per cent of broadband subscriptions. Cable connections make up 35 per cent of connections, while apartment LAN and wireless technologies cover 8 per cent of subscribed homes (see Figure 2.2). Although broadband via cable modems was the first to be offered in Korea, ADSL has now overtaken cable, despite the later start, because of its much more extensive installed network. This strong inter-modal competition has brought down prices and introduced technologies that can serve remote areas.

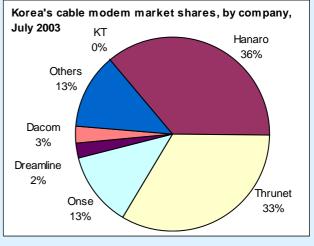


Inter-modal competition in Korea is different from many other economies because a single carrier may offer broadband service over a wide range of technologies. Hanaro, for example, offers broadband over five different technologies: xDSL, cable modem, apartment LAN, LMDS (B-WLL) and wireless LAN. The incumbent, KT, offers access over 5 different technologies: xDSL, apartment LAN, wireless LAN, satellite and WiBro.

Figure 2.3: Fierce inter-modal and same-technology competition

Breakdown of market share, by technology





Source: International Cooperation Agency for Korea IT.

The number of technology options available from a single provider (e.g. Hanaro) might cause concern in other economies since broadband rollout is often delayed, by conflicts of interest, in economies where telecommunication operators own cable companies (e.g., in Scandinavia). However, the Korean example is different for several reasons. First, the competitive market is mature with extensive networks over many technologies. Second, open access on broadband networks allows any carrier to provide service over other types of networks. A carrier such as Hanaro has open access to KT's unbundled loop, as well as Thrunet's extensive cable network. This allows Hanaro to provide service nationwide and over multiple technologies, even if it does not have a physical network presence in the area.

Intermodal competition in Korea is fierce and users have many choices available to them (see Figure 2.3). While xDSL and cable technologies make up the brunt of connections, wireless technologies will have a much more pronounced roll in the future. KT's Nespot (WLAN) service has built an extensive Wi-Fi access network around the country and continues to grow (see Box 2.1). Also, new wireless data technologies are in the planning phase that should allow seamless data connectivity and movement throughout the country. These are discussed in Chapter 4.

Box 2.1: Wi-Fi connectivity across Korea

How KT's NESPOT service is quickly making broadband portable

KT's NESPOT service offers wireless LAN access (Wi-Fi) in 10'000 areas around the country. Wi-Fi access points are located in areas such as universities, hotels, exhibition halls and other public areas. In addition, NESPOT subscribers around the country have their own Wi-Fi access points at home, which extend the reach of the overall wireless network. KT expects the network to grow quickly as more and more users join and become nodes.

There are several ways to access the NESPOT network in Korea. First, KT's xDSL (Megapass) subscribers pay an extra US\$ 8.40 (10'000 W) a month for unlimited NETSPOT usage at home and from any of the country's access points. Non-KT subscriber, travellers, and others can also pay by the minute or hour to access the network where there is coverage. A wide variety of tariffs and packages are available. For instance, the basic hourly rate is 3'000 Won (US\$3.00), while the cost of a monthly subscription starts at 32'500 Won (US\$32.30)

Source: KT.

In addition to competition among technology, there is also strong competition within individual technologies (e.g. multiple xDSL providers). KT and Hanaro are the main players in the xDSL market. Hanaro was the first Internet service provider (ISP) in the world to offer DSL services and had an early lead on KT due to

KT's reluctance to reverse its strategy of investment in ISDN. However, as soon as KT realized the threat from Hanaro, it quickly changed tack and has now overtaken Hanaro's xDSL in terms of DSL subscribers. As of July 2003, KT had 79 per cent share of the ADSL market although competition from Hanaro is keeping the pressure on for faster speeds and lower prices (see Box 2.2).

One of the key elements behind the fierce competition over the same types of technology is open access. Many economies have unbundled the local loop, with varying success. However, Korea has gone a step further by also unbundling the cable loop. This has allowed competitors to take unbundled lines from the incumbent operators to provide competitive service. The effect has been astounding on penetration, prices, and speed.

Box 2.2: The rise of a strong broadband competitor: Hanaro

In many economies around the world, incumbents dominate in broadband. This is especially true in Europe where incumbents dominate the DSL market.⁴ In addition, the incumbent generally supplied the remaining DSL lines, either by wholesale or through local loop unbundling. The Korean experience is different and demonstrates the possibilities for genuine infrastructure competition.

KT still has a large portion of the DSL market, with a 79 per cent market share in July 2003, but Hanaro also has a strong showing in DSL, in addition to having the largest market share for cable modem connections.

The Korean Government realized that the country needed a second, competitive carrier in order for competition to flourish. With government encouragement, several of Korea's conglomerates or *chaebol* jointly formed Hanaro as a strong competitor to the incumbent KT.

This strong financial backing has been a large benefit to the broadband market. First, Hanaro had enough financial support to build out its own infrastructure in many parts of the country. Hanaro runs fibre connections to the basements of large apartment buildings and business districts, alongside similar lines from KT. In apartment complexes, these multiple fibre connections are terminated in the main distribution frame (MDF) room and the final meters of broadband are delivered over high-speed VDSL. Hanaro has targeted apartment complexes with more than 200 apartments as potential subscribers. In areas where Hanaro hasn't been able to justify a second network outlay, it can simply use unbundled lines from KT (xDSL) or Thrunet (cable). Hanaro initially bid also for a WiBro licence, but later withdrew when the first payment became due, citing increased competition in the fixed-line broadband market.

True facilities-based competition has had an astounding effect on the market. It has effectively lowered prices below, and raised speeds above, those available almost any other economy. This is because profit margins are squeezed by the low prices and broadband providers are forced to compete on speeds and services (see Box 2.3).

2.1.3 Government involvement

The Korean Government has been very successful at fostering certain industries that it deems "strategic". The Government makes small, strategic investments that evolve into much larger investments from the private sector. Examples include becoming an anchor tenant of the fibre backbone throughout the country and the new push to make Korea the leading world IT economy by 2010. The Korean Government was also instrumental in encouraging the formation of Hanaro, as a strong competitor to KT. This has been a huge boon for the broadband industry and the high competition is a major factor behind Korea's high penetration rates

More recently, the Government has promoted different schemes designed to allow Korea to take a leadership role in emerging technologies, notably the "U-Korea" programme, the "Broadband IT Korea Vision 2007" and the IT 839 strategy. These are discussed further in chapter five.

2.1.4 Geography

A thriving competitive market and keen government participation have helped propel Korea to the world leading position in broadband. However, Korea's geography and demographics have also played a key role in its success. 47 per cent of Koreans live in apartment complexes and roughly 93 per cent of all households are within 4 km of a telephone exchange.⁵

As most Koreans live in apartments or multi-dwelling units (MDU), telecommunication firms have less distance to travel and money to recoup for traversing and connecting the last mile. In Korea, most apartment complexes consist of multiple 15-storey buildings with a central telecommunications exchange, or main distribution frame (MDF). Telecommunication service providers terminate their lines in the MDF and the

telephone network from the MDF to individual apartments is privately owned and operated by the apartment complex. This creates a positive incentive to a competitive telecommunication provider such as Hanaro because by installing one fibre optic line to the MDF, it can offer services to uses in the complex without having to pay KT for use of the unbundled local loop. As a result, Hanaro has built an extensive fibre network to apartment complexes with at least 200 potential customers.

Korea's broadband success is often attributed to these three main factors: competition, active government involvement, and geography. Indeed these have laid the foundation for a highly developed network. However, the main reason for the success of broadband in Korea is the high-quality broadband services that Koreans enjoy.

2.2 Growth of broadband services

Korean broadband services fall into several main categories: information retrieval, e-commerce/e-banking and entertainment. The traditional Korean culture has adopted and embraced the way broadband and Internet connectivity can provide near-instantaneous access to information.

The World Wide Web is the foundation for a vast amount of information in Korea. Koreans often look to the Web first for everyday information such phone numbers, traffic information, and driving directions. This type of web-research is common in many parts of the world. What makes Korea unique is the sheer number of users connected and the positive development incentives to content providers. With 70 per cent of households connected, most businesses find it worthwhile to include vast information about their company on the Web.

E-commerce is also a huge driver for broadband adoption. For much e-commerce, the high broadband speeds in Korea don't play as key a selling point as always-on connectivity. In 2002, nearly 75 per cent of stock trades were done online. While both men and women trade stocks online, it has been the vast number of Korean "housewives" trading shares that has helped increase broadband penetration. This translates into higher online times; Koreans spend an average of 16 hours online a week, compared with 10 hours for Americans and four hours in the UK. This is only possible because the vast majority of Korean users have flat-rate, always-on subscriptions rather than volume or duration-based tariff options.

Information retrieval and e-commerce, while important drivers, are not the favourite use of broadband in Korea. That distinguished title goes to e-entertainment. Koreans use their broadband connections for online gaming, video on demand, and video chat services.

2.2.1 Gaming

In Korea, online gaming is centred around the "PC Bang" or PC Room. PC Bangs are cybercafés dotted around the country and offer broadband access and gaming for around 1'000 Won (US\$1) an hour. While the cybercafés are also commonly used for e-mail and other web browsing, they are mostly used as online game havens. This may be surprising given Korea's high household penetration rates for broadband. However, parents generally subscribe to broadband to help their children's studies, not for playing Starcraft during all hours of the night. This has created a niche market for PC Bangs throughout the country. In addition, using the computers in a PC Bang is a social event. Often PC Bangs will have love-seat style chairs where couples can each be on a computer but still sitting close to one another.

The Korean love affair with online gaming seems to be an interesting evolution. Until recently, gaming had a strong stigma attached to it. However, this started to change with the introduction of multi-user games (MUGs) and Role-Playing Games (RPGs). Instead of these games being considered antisocial, they offered a way for Koreans to interact with each other through the games. The fast broadband networks in the country allowed for users to play games against one another with almost no delay from network congestion. Key games such as Starcraft and Lineage drove the growth of the Korean online gaming industry.

Korean online gaming firms are hoping their new products will be able to take a larger percentage of the 32 billion dollar computer games industry (hardware and software)⁶. The broadband gaming world in Korea is now dominated by massively multi-player online role-playing games or MMORPGs. These games form entire fantasy economies where players meet, interact, and even battle against one another using avatars. One of the key reasons these games have been a huge success in Korea is they offer the ability for groups of players to form alliances with others in clans and groups. This *camaraderie* helps keep online gamers less isolated. In fact, one of the main selling points of Korean games is they include more opportunities for players to interact and chat online than other popular games such as Everquest. Some of the more popular

online games in Korea are ArchLord offered by Hangame (www.hangame.com), Kangjin soccer, offered by Netmarble (www.netmarble.net) and Lineage offered by Netwarble (www.netmarble.net) and Lineage offered by Netwarble (www.netwarble.net) and Lineage offered by Netwarble (<a href="www.netwarble.netwarble.netwarble.netwarble.netwarble.netwarble.netwarble.netwarble.netwarble.netwarble.netwarb

2.2.2 Multimedia

Korea's high penetration rates have given incentives to online multimedia distributors to create content and make it available over the web, either through the computer monitor or connected directly to a television. Several companies, like Daum (http://movie.daum.net/) the leading Korean Internet portal, provide movies on demand to users in DVD quality. Korea's traditional terrestrial television broadcasters also make their programs available on the web. Users can watch the programs for free in real-time using their computer or pay a small fee (usually 300 Won) to watch a programme from the archive. The archive has been a particularly popular way for Koreans to follow their favourite dramas. A similar strategy is now being pursued for providing video entertainment to mobile handsets.

Terrestrial broadcasters and portals currently deliver video-on-demand services but they are not the only players in town. Its-TV.com (http://www.its-tv.com/) is an interactive video provider that offers films and music videos to consumers at 4 Mbit/s speeds. The company uses set-top boxes on top of the television that receive their signals over a broadband Internet connection. The service is becoming popular because of the high quality films and the ability to watch overseas content including CNN and StarTV, a popular service among Koreans learning English.

Broadband Internet providers are also looking into ways to offer quality-added video services to their offerings. Hanaro started a trial service in June 2003 that is IP based and connects directly to the TV through a set-top box. KT currently offers video-on-demand to its ADSL Megapass subscribers for 1'000-2'000 Won (US\$1-2) a movie under the brand name Homemedia (http://homemedia.megapass.net). At any given time, there are 400+ movies available for streaming to users on the network. KT was able to work out a revenue sharing model with film distributors where the film distributor receives a minimum guarantee plus a percentage of profits. KT is planning on having more than 1'000 films available soon.

2.2.3 Multimedia: Audio

Koreans use their broadband connections to listen to CD-quality audio over the web. Shoutcast.com, a vast directory of streaming MP3 sites lists Mulkulcast.com (a Korean home-spun radio station) often as the most popular MP3 streaming site in the world. What makes the feat even more impressive is the streams are all in Korean with Korean pop music, and therefore restricted to the relatively small global population of Korean speakers.

2.2.4 Customer service

Korea's service sector is known for its attention to customers and this extends to broadband for several reasons. First, the level of competition in Korea is so high that providers know if they don't retain a customer, another provider will pick them up right away. Second, the expectations for customer service are very high in Korean culture (see Box 2.3).

2.3 Regulatory trends

The regulatory environment in Korea, as mentioned earlier, has allowed for exceptional growth in broadband penetration and service offerings. Open access policies have allowed competitive carriers to use equipment on other carriers and lowered prices. The mixture of both traditional telephone and cable data unbundling has been a key element in boosting the strength of Korea's competitive carriers.

In addition, the Korean Government has maintained regulatory control over Internet exchanges, in an effort to offer better connectivity to all competitors. Currently there are three private Internet exchanges and one non-profit exchange.

Box 2.3: The incredible customer service of Korean broadband providers

When your computer isn't working, call the broadband provider

Koreans demand impeccable customer service. Koreans never have to serve themselves at petrol stations and receive gifts (including extended auto insurance coverage for a week after purchasing petrol) just for choosing one filling station over another. Broadband providers, like petrol stations, have found improving customer service to be a successful method for attracting users.

Koreans who want to sign up for broadband can place a call to the broadband provider in the morning and will be connected within 24 hours, and often before the end of the same day. The providers know that if they don't connect users quickly, another competitor will.

In addition to fast hook-ups, and free multimedia access (comics, anime, movies, ebooks etc), Korean broadband firms are also offering computer repair services to users. As an example, Hanaro offers a PC repair service and online remote services for free to its subscribers. If a user's computer breaks down, Hanaro can run remote diagnostic programs to see what is the problem. Then, it will send out a technician to help repair the computer if necessary.

This high level of customer service is an attempt to build brand loyalty that in turn will help Hanaro and other broadband providers sell other value-added services via their portals.

2.3.1 Universal broadband access

KT was originally a government owned incumbent until 1993 when the Government started selling shares. This process was finally completed in 2002 with the Government selling its final stake in the company. However, as a condition of complete privatization, KT has to deliver broadband to all villages in the country (e.g., universal service for broadband). The threshold for broadband is considered to be 1 Mbit/s or higher. Other economies have *talked about* universal access for broadband but Korea is one of the first to implement it and is definitely the closest to bringing it to fruition.

2.4 Conclusions

Korean broadband penetration leads the world, its speeds are among the fastest, and its subscription charges are among the lowest in the world. This success is a result of many factors including, a fiercely competitive market structure, key government involvement, and geography. More than 75 percent of Korean households have a broadband connection and some think the market is near saturation level. This makes Korea a fertile proving ground for broadband services, since no other economy is close to its penetration level. While Korean broadband experience clearly has elements unique to Korea, other economies can borrow competition policies and lessons on successful government involvement from Korean broadband.

Widespread, low-cost, high-performance broadband coverage is essential to the realization of ubiquitous network societies because it provides a platform to support the development of other services. But broadband alone would not be sufficient, because the concept of ubiquity is based on the ability to shift from one location (and from one network) to another, seamlessly. For that, it is necessary to have broadband-quality performance on the mobile networks too; the topic of the next chapter.

3 Mobile communications

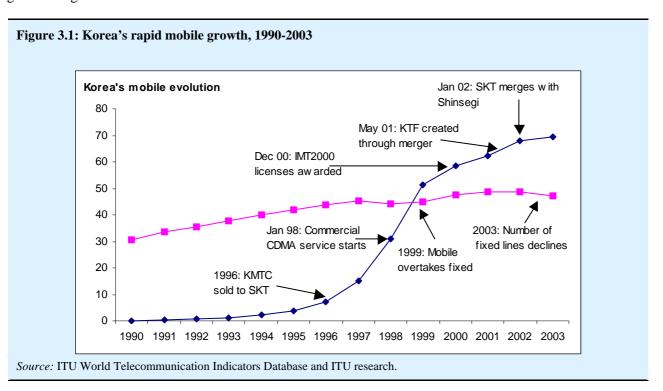
Misplacing a mobile phone is traumatic for Koreans. That's because when a Korean loses their handset, they have lost much more than their phone; they have potentially lost their web browser, game console, electronic wallet, house keys, video camera, still camera, MP3 player, and organizer all in one. To Koreans, their mobile handsets often represent their digital connection to friends, family and the world.

The Koreans mobile market is fascinating because Korea is a world mobile leader on many fronts. First, Korean mobile operators were among the first operators in the world to offer third-generation mobile (3G, or more correctly IMT-2000) services. Korea has also been the world-leading mobile market offering CDMA services. In addition, Korean handset manufacturers Samsung and LG have the world's third and fifth largest market shares respectively, and are constantly receiving accolades for their phone design and innovative features.

It makes sense, therefore, to look deeper into the Korean mobile market as a way to understand the Korean ubiquitous network society. What types of user services, network architectures, mobile policies and business plans have made this success possible? This section will examine the path Korea has followed to achieve this success. The section will first look at the history of the Korean mobile market, with special detail on Korea's fast mobile growth. Next, the section will look at the three leading mobile operators and their networks. This will be followed by a section detailing some of the services that have been introduced and embraced by Korean users, including a section on the cutting-edge terminals, produced in Korea, that make these services possible. Finally, the last section of the section will explain some of the key mobile policy decisions that have served as a foundation for Korea's mobile market.

3.1 Overview of mobile

The mobile market in Korea is one of the most advanced in the world and boasts nearly 100 per cent coverage across the peninsula. Korea's mobile penetration rate in 2003 was 69.4, compared with a fixed penetration rate of 47.2 subscribers per 100 inhabitants. Selected highlights of Korea's mobile growth are given in Figure 3.1.



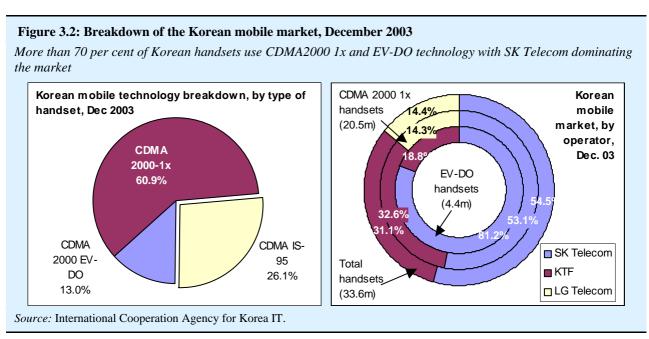
The evolution of mobile telephony in Korea has gone through several distinct phases.

 1984–1994. Analogue cellular services started in Korean in 1984 by Korea Mobile Telecommunications Service (KMTS), a subsidiary of Korea Telecom. During the 11-year period between 1984-1994, KMTS enjoyed a monopoly in the provision of cellular services. The period saw relatively slow mobile penetration growth and by 1995, cellular penetration had only reached two subscribers per 100 inhabitants, one of the lowest levels among the advanced Asia-Pacific economies. In 1994, KMTS was sold to the SK group and is now does business under the name of SK Telecom (SKT).

- 1995-2000. The six-year period between 1995 and 2002 marks Korea's strong CDMA years. Digital CDMA voice services (IS-95A) were launched in January 1996. From this period on, penetration grew rapidly to cross the symbolic 50 lines per 100 inhabitants. Few countries have transformed their mobile communication sectors so rapidly. During this period, four new operators entered the market, each using CDMA technology: Sinsegi Telecom operated at (800 MHz) while Korea Telecom Freetel (Now KTF), LG Telecom, and Hansol (later M.Com) became Personal Communication Services (PCS) operators at 1.8 GHz. October 2000 marked the transition from CDMA(IS-95A) to CDMA2000 1x and the launch of CDMA2000 1x in October 2000 (although commercial services only arrived a few months later).
- 2001 to date. The period coving the last few years corresponds with somewhat slower growth in the number of mobile voice subscribers, as the market approaches saturation (only 2.1 per cent between 2002 and 2003). Instead the focus has shifted to the development of mobile data applications. CDMA2000 1X mobile data services were launched in October 2000, CMDA2000 1x EV-DO in May 2002 and services in the IMT-2000 2.1 GHz band were licensed in December 2000 for launch in 2004. More recently, WiBro services have been licensed with a view to introducing more competition in the market. Two of the three available WiBro licences were won by fixed-line operators (KT and Hanaro) while the third went to an established mobile operator (SKT). Thus, even though no "new" operators entered the market, the licensing process should help to accelerate both competition and convergence between fixed and mobile networks. Push-to-talk services have also been launched in early 2005. This period also has seen a consolidation in the number of operators, with SK Telecom acquiring Shinsegi and KT Freetel acquiring Hansol to become KTF.

3.1.1 Mobile overtakes fixed

Mobile subscribers in Korea first outnumbered fixed line subscribers as long ago as 1999 (see Figure 3.1). Korea was one of the first 15 economies worldwide to make the transition. In 2003, Korea commenced on another significant transition as fixed lines fell in number by 380'000. The number of fixed lines had fallen slightly also in 1997, but that was due to the effects of the Asian Financial Crisis and was quickly reversed. This time the fall in fixed lines is not due to economic factors but rather because mobile phones are increasingly being seen as substitutable for fixed lines, and an increasing number of households are choosing to have only a mobile connection (or perhaps a mobile phone and broadband over cable modems). However, it is too early to tell whether this downturn marks a decisive trend, or just a blip.



3.1.2 SKT

SK Telecom (SKT) is the largest mobile operator in Korea, with a market share of 54.3 per cent as of September 2003⁸ and profits of US\$ 1.66 billion (1.94 trillion won) from US\$ 8.13 billion (9.52 trillion Won) in revenues at the end of 2003.⁹ SKT was the first mobile operator in Korea, offering analogue services under its former name, KMTS. SKT was also the first to launch digital CDMA services in 1996. SKT is considered the dominant mobile operator and thus has its prices regulated by the Ministry of Information and Communication (MIC). In January 2002, it completed the takeover of Shinsegi Telecom, its leading competitor in the CDMA 800 MHz field. In order to satisfy MIC requirements for allowing the acquisition, SK Telecom had to reduce its combined market share to below 50 percent. SKT was able to accomplish this by *demarketing* (getting rid of their least profitable subscribers and not advertising for new ones). However, it has subsequently grown beyond the 50 per cent mark again (see Figure 3.2).

SKT was the first in the world to offer mobile data services over its standard CDMA network (IS-95). In October 2000, it launched its CDMA2000 1x service under the brand name "Nate." In January 2002, it commercialized its CDMA2000 1x EV-DO (1x evolution, data optimized) service with great success. As of December 2003, it had 16.4 million mobile Internet handsets with 13.2 million of those subscribing to *Nate*. ¹⁰

In addition to its CDMA2000 licence in the 800 MHz range, SKT has a W-CDMA licence in the 2 GHz band and is set to launch limited service in early 2004. It also won a WiBro licence in 2005.

3.1.3 KTF

KTF is the second largest mobile network operator in Korea and had a market share of 31.5 per cent as of Sept 2003. At the end of the fiscal year 2003, KTF reported a net profit of US\$ 348 million (407 billion won) on revenues of US\$ 4.33 billion (5.08 trillion won). KTF, like SK Telecom, has its roots in Korea Telecom, which owns a 40 per cent stake in the company. This came about through KT FreeTel, which merged with M.Com (now KTM.com) in May 2001. KTF has a CDMA licence to operate in the 1'800 MHz band. In addition KTF has a W-CDMA licence in the 2 GHz range and is expected to roll out limited service in early 2004 in parts of Seoul. KTF currently has all types of CDMA networks currently in use, A/B networks, 2000 1x, EV-DO and EV-DV.

3.1.4 LG Telecom

LG Telecom is the third mobile operator in the country and operates in the 1'800 MHz range with a PCS licence. It is the smallest of the three mobile carriers with a 14.2 per cent market share as of September 2003. LG Telecom, like SK telecom, is one component of a much larger conglomerate, or *chaebol*. SK Telecom is a member of the SK group of companies whileLG Telecom belongs to LG (formerly Lucky-Goldstar). LG Telecom is the smallest mobile operator and has struggled to win market share, despite a sister company in the *chaebol*, LG Electronics, being the worlds 5th leading manufacturer of mobile handsets (see Table 4.1).

While SKT and KTF both successfully bid for W-CDMA licences, LG Telecom instead was awarded another CDMA2000 licence in the 1 GHz range, which may ultimately prove more interesting.

LG Telecom makes use of its sister companies to distribute and sell its services. These include gas stations and supermarkets, much like similar marketing strategies used by SKT.

3.2 Network

Korea's mobile network is based on CDMA technologies jointly developed by ETRI and Qualcomm. All three Korean operators use CDMA, although at different frequencies. Network coverage is excellent and universal for all three carriers throughout the country. The only differences in coverage are the type of CDMA technology available. SKT's coverage is the most advanced, with almost all areas served with CDMA2000 1x EV-DO.

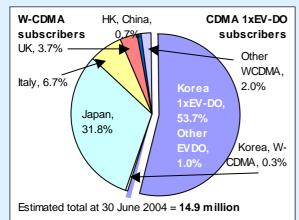
Korea's embracing of CDMA technologies has meant network upgrades have been relatively simple when compared to countries with only GSM networks. Older CDMA (IS-95) networks (cdmaOne) were first upgraded to CDMA2000 1x, and more recently are being upgraded again to CDMA2000 1x EV-DO and EV-DV (see Table 3.1). This has made the transition from second to third generation services much faster for Korea than other countries since no new extensive network infrastructure needed to be built. Korea and Japan currently dominate the 3G market worldwide (see Figure 3.3).

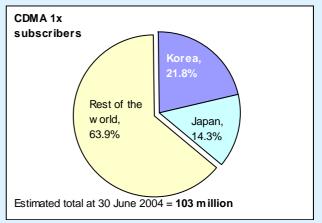
Table 3.1: CDMA development in Korea

	Speed	Adopted in Korea
CDMA (IS-95)	13.5 kbit/s	Jan 1996
CDMA2000 1x	153 kbit/s – 307 kbit/s	Oct 2000
CDMA2000 1x EV-DO (evolution data only)	700 kbit/s – 2 Mbit/s	Jan 2002
CDMA2000 1x EV-DV (evolution data and voice)	3.1 Mbit/s	2004

Figure 3.3: Korea and Japan dominate the 3G market worldwide

Breakdown, by country, of 3G subscribers worldwide at 30 June 2004, broken down by technology





Source: "ITU Internet Reports 2004: The Portable Internet", drawing upon ITU World Telecommunication Indicators Database, www.3Gnewsroom.co.uk, www.ac.uk, <a href="https://www.ac.uk

Korea's original CDMA licences were awarded via a beauty contest with SKT receiving a licence in the 800 MHz range and LGT and KFT receiving allocations in the 1'800 MHz frequency. Korea held auctions for two W-CDMA licences in 2000 with all three mobile providers bidding for the two available licences. At the same time, the Ministry accepted bids for additional CDMA2000 licences, with only Hanaro Telecom bidding.

The Ministry accepted the bids of SKT and KTF for W-CDMA licences. Each was required to pay nearly US\$ 1 billion for their licence. In order to sweeten the prospect of CDMA2000 licences, the Government allowed providers to choose preferred spectrum and offered favourable loan rates for build outs in rural areas¹¹. While LG Telecom was unsuccessful in its bid for a W-CDMA licence, it later purchased a second CDMA2000 licence for roughly US\$ 100 million (1.3 trillion Won), a mere tenth of the amount spent on W-CDMA.

The auctioning of W-CDMA, CDMA2000 and WiBro licences highlights a key dilemma faced by Korean policy-makers. Each technology is seen as vital to a different segment of the Korean market. The Korean Government is interested in developing a domestic network using the same standard as a large part of the rest of the world. This makes it much easier for domestic manufacturers to sell domestically produced phones abroad, increasing the worldwide mobile market share of Samsung and LG. For that reason, Korean companies such as Samsung are also heavily invested in building W-CDMA cell towers, which will be sold around the world.

However, Korea is the world leader in CDMA technology and CDMA2000 1x has achieved much of its success in the 3G market due to the fact that it is a relatively simple upgrade from CDMA IS-95 (whereas W-CDMA requires GSM operators to build new network). In addition, the Korean Government receives royalties from all CDMA2000 handsets sold in Korea because of pioneering work done by the Government research institute, ETRI (see Box 3.1).

Box 3.1: ETRI and the development of CDMA technologies

Koreans were offered their first analogue mobile phone service in 1984, Advanced Mobile Phone Service (AMPS). The network was built using infrastructure and mobile terminals from large US telecommunication firms. In 1988, Korea successfully hosted the Olympic Games and the momentum from the event helped shift the Government's view of telecommunications from a technology they needed to control to one they could exploit economically.

Korean network operators were looking to upgrade their networks to digital technologies and most of the world was looking towards a promising technology from Europe, GSM. The research branch of the Ministry of Information and Communication, Korea's Electronics and Telecommunications Research Institute (ETRI), was given the task of coming up with a new mobile technology that could be implemented in Korea and help spur economic growth.

After careful research, ETRI decided that CDMA technology made more efficient use of the radio spectrum and represented the best possibility for Korea mobile telephony. CDMA technology wasn't new as it was originally developed in the 1940s as a military technology to mask conversations. The technology was important to the military because instead of sending all data over one frequency that could easily be eavesdropped, CDMA breaks up the data into small pieces that are spread over the frequency band in a pre-defined (but pseudo-random) manner. Receiving devices must know the "frequency hopping pattern" in order to correctly decipher the data.

Qualcomm, a small corporation in the US at the time, owned seven key CDMA patents and ETRI quickly stuck a deal and went to work with Qualcomm developing and perfecting the technology. ETRI and Qualcomm decided on a profit sharing deal where 80 per cent of licensing profits from CDMA phone sales in Korea would go to Qualcomm. The other 20 per cent would belong to ETRI.

The partnership was probably more successful than either of the parties would have initially imagined. Korea was able to launch the world's first commercial CDMA service in January 1996 in increase its penetration rate from 3 users per 100 in 1995 to 68 per 100 in 2002. The success has also helped Korea become one of the world's few 3G countries. Qualcomm has also benefited by rocketing to becoming a global telecommunications powerhouse.

ETRI is expected to collect royalties worth an estimated US\$ 200 million by the year 2008 for its share of the technology. Royalty payments received so far have strategically re-invested in developing other key technologies. Source: http://times.hankooki.com/lpage/tech/200304/kt2003043017080611790.htm and interviews.

The third technology licensed in 2005, WiBro, is important because it provides a logical migration path for those fixed line operators that are seeing their core business decline and need to be able to exploit the potential convergence between fixed and mobile networks that the ubiquitous network society offers. Korea's home-grown WiBro technology also offers an alternative to the more international WiMAX standard, in a manner which is similar to the way in which CDMA offers a local alternative to GSM. However, the export potential of WiBro is, as yet, unproven.

These three, often contradictory, policy objectives pose problems to Korean mobile promoters. Rather than choosing one technology, the Government has instead decided to attempt to have three co-existing networks running three types of technologies. The risk of this policy is that, in the effort to standardize with the rest of the world, Korea operators may confuse their own consumers.

3.2.1 IMT-2000

Currently, there are two main IMT-2000 technologies in Korea, CDMA2000 and W-CDMA. Both offer relatively high-speed data transfer for small amounts of data at reasonable cost. Currently CDMA2000-1x EV-DV offers maximum speeds of 5.2 Mbit/s while proposed W-CDMA HSDPA networks could theoretically deliver between 8-14 Mbit/s.

In many other economies, third-generation mobile services (IMT-2000) have been slower to materialize due to a collapse in telecommunication investment and exorbitant auction fees paid by operators. Korea's initial choice of CMDA2000 made network upgrades much easier but the future of IMT-2000 in Korea is still not clear.

When industry players and governments met to formulate the IMT-2000 standard it was seen as visionary and represented the future of mobile telecommunications. What was not apparent at the time was how fast the industry would advance before these networks would materialize. Only now has the world started rolling out 3G, and usually only in limited areas. However, the CDMA technologies preferred by the Koreans have continued to grow in speed to the point they are as fast, or faster than other 3G networks such as W-CDMA being built around the world at great expense. This represents a large dilemma for Korean operators SKT and KTF that have purchased the licences.

Each of the operators bid US\$ 1 billion for W-CDMA licences, but have since perhaps been hesitating to build out extensive networks given the huge expense in building a new network from scratch. Instead, operators may be more interested in upgrading their CDMA2000 networks. Many analysts and industry observers are expecting only limited rollouts in densely-populated areas as a way for operators to fulfill their timetable obligations.

IMT-2000 was originally seen as a sort of "broadband for mobiles". However, Koreans are increasingly looking to a new frequency band for wireless Internet access, 2.3 GHz, the Portable Internet. This concept is explained in more detail in section four.

The key question is whether users will be willing to pay as much for data as they pay for voice. If not, the limited speeds and bandwidth of W-CDMA make it best suited for voice and medium-speed data applications. The dilemma is that voice and medium-speed data is already handled very well by existing CDMA2000 networks.

Korean handset manufacturers are covering their bets by building dual-band and dual-mode handsets that operate on both CDMA and W-CDMA networks.

3.2.2 Beyond IMT-2000

While much of the attention in the mobile world has been focused on ensuring smooth and profitable 3G rollouts, Korean operators and policy makers have already begun preparing for life "beyond IMT-2000"¹². These new networks have been defined to include New Mobile Access, IMT-2000, IMT-2000 enhancement¹³ and high speed wireless LAN¹⁴, which can provide seamless access, are always on, and work in an IPv6 environment.

Korean research is being led by ETRI, which has started developing wireless LANs capable of delivering 500 Mbit/s in the 5GHz frequency band as well as other core WLAN technologies at 60 GHz offering very high-speed 1 Gbit/s services. There is also strong interest in continuing work with IEEE 802.11n technologies in an effort to enhance international cooperation and standardization activities.¹⁵

One promising new technology which has recently been licensed in Korea is the portable Internet or "WiBro". This is further discussed in Box 3.2 and chapters four and five. Developers are promising eventual speeds of the wireless Internet based, all IP infrastructure to reach 30 - 50 Mbit/s to slow-moving users.

Box 3.2: Licensing WiBro

Korea's homegrown version of the portable Internet is called "WiBro". The term is short for "wireless broadband" or alternatively "wide broad Internet", but it also carries connotations of being "WiFi's little brother". WiBro occupies a similar space to that of WiMAX (IEEE802.16e), but with a crucial difference, namely that it permits handover between cells, making it usable in moving vehicles. Speeds on offer are around 1 Mbit/s, with service available over a radius of 50km from a base station (making it relatively economic to establish a network) and available to vehicles moving at up to 60 km per hour. As such, WiBro could be positioned as a cheap, data-intesive version of 3G cellular, and/or as a lower bandwidth but higher-mobility version of WiFi. 16

Korea's decision to push ahead with licensing WiBro has not been without criticism. Some have accused MIC Korea of pushing the technology to market before the standard (WiMAX) is ready and thereby, implicitly, locking out foreign investors. Nevertheless, as with Korea's courageous decision on CDMA in the early 1990s, establishing Korea as a test bed for WiBro will allow Korean operators and vendors to steal a march on the emerging portable Internet industry. Possibly as a sop to this criticism, the Ministry has undertaken to introduce a Mobile Virtual Network Operator (MVNO) once WiBro reaches five million subscribers.¹⁷

The spectrum allocated for WiBro is 100 MHz between 2.3 and 2.4 GHz. Three licences were awarded with each of the three bidders paying between 117 billion and 125.8 billion Won (US\$ 117-126m). The winning bidders were SK Telecom, the dominant mobile operator, plus the two fixed-line operators, KT and Hanaro Telecom, though Hanaro later withdrew, when the first payment became due. WiBro can be seen as a precursor to increasing fixed-mobile convergence, and as a possible way for fixed-line operators to win back some of the market they have lost to the mobile operators (e.g., among those households that now have a mobile phone but no fixed-line telephone).

Source: ITU, MIC Korea.

3.3 Mobile policy

Researchers cannot study the success of IT in Korea without first examining the role of targeted government policy and technology promotion. While many factors contributed to Korea's current mobile success, government policy decisions early in the 1990s have played a major role in shaping the industry.

Korea's ascension as a leading telecommunication economy arguably didn't start until 1991 when the country started one of its most successful IT research to date, the commercialization of CDMA. The technology, originally developed by Qualcomm, was put into commercial use for the first time in the world by a Korean consortium consisting of ETRI, Samsung, LG, Hyundai, SKT and Maxon. Korea's early success with CDMA mobile communication has been a key factor in helping spur the country's 16 billion strong sales of mobile handsets in 2003. CDMA was thus a turning point for Korea in its progress to its leading mobile communication and ICT position (see Box 3.3).

Korean government policy has also played another key role in the success of Korea's mobile market through fostering extensive competition. Initially, the government allocated three PCS¹⁹ licences and two cellular licences (SK Telecom and Shinsegi) in the mobile market that had previously been dominated by KMT. The high level of competition among the five (now consolidated to three) operators has kept prices comparatively low and voice quality high. It has also forced Korea's mobile operators to compete on innovative value-added services. Korea's handset manufacturers have also helped maintain market competition by quickly integrating new service offerings into hardware designs of new phones.

Forward-looking government policies have been extremely successful at targeting key industries and technologies for development. At the same time, government policies have also focused on training the population on how to use these new, cutting edge technologies.

Box 3.3: Difficult decisions surrounding early CDMA adoption

The Korean Government's decision to focus on CDMA technologies has been one of its most visionary but also most controversial decisions in the Korean ICT sector. Although Korea has been more successful in selling CDMA as an "international" standard that, say, the Japanese PDC and PHS standards or the US-led TDMA standards, it is still not achieved the worldwide acceptance of GSM. Nevertheless, as the world starts the transition from second to third generation mobile standards, Korea is now well-placed and the decision to go with CDMA seems quite visionary, Nevertheless, policy-makers were faced with difficult choices and risks in the early 1990s in regards to unproven CDMA technology.

At the time, Korea was a heavy user of TDMA technology and a switch to CDMA represented a huge risk for an immature mobile market. The volatile debates over the use of TDMA or CDMA technologies came to an end in late 1993 when the US Telecommunication Industry Association (TIA) recognized CDMA as an IS-95 standard, paving the way for its use in Korea.

While CDMA technology had been used in military projects, the new technology had never been adapted for commercial use and was widely considered unproven. Korea benefited from this uncertainty because it forced Qualcomm to be less restrictive on the use of its intellectual property and opened up favourable licensing options for Korea.

The Korean Government promoted the research and development necessary to commercialize the technology in two parts. ETRI and Qualcomm took charge of switch design, prototype development and base transceiver station (BTS) design while the designated handset manufacturers developed new mobile handsets and switching systems. During the development, the ministry laid out a specific time schedule to shorten the CDMA development cycle. All together, the initiatives were well-organized and extremely successful, allowing SK Telecom and Shinsegi to roll out the first CDMA commercial service in the world in 1996.

Currently, CDMA2000 technologies represent a major mobile presence in the world with networks available throughout Asia and the Americas. As large Asian countries such as China, India, and Japan have developed networks, CDMA users worldwide have grown from 0.3 percent of all mobile users in 1996 to 14 per cent in 2004, representing more than 240 million subscribers around the world.

Source: MIC, CDMA Development Group.

3.3.1 Policy decisions

As mentioned above, one of the greatest dilemmas in Korean mobile policy rests, to a large extent, with the mobile operators and how they will make use of their W-CDMA licences. The Government put coverage obligations in place as conditions of the auctions and providers will have to adhere to them. What is unclear

is how much further the providers are willing to go with their networks. Essentially, if new technologies such as the portable Internet (WiBro) are used mainly for data, then carriers will use CDMA2000 1x and W-CDMA networks to carry the bulk of their voice traffic.

3.3.2 Subsidized handsets

Korea's original quick take-up of mobile handsets can partially be attributed to a government policy on handset subsidies. When CDMA IS95A networks were introduced in 1995, the handsets were very expensive and many Koreans would not have been able to afford buying them outright. This was especially important because the combination of high-priced handsets and new technology created a high risk for consumers buying new terminals.

As a result, the Korean Government instituted a policy where mobile providers were allowed to lock subscribers into two-year, exclusive contracts in exchange for giving the handsets away for free to subscribers. In addition, the Government kept the maximum price providers were allowed to charge perminute high enough that mobile carriers could earn sufficient revenues to pay the manufacturers for the handsets. The price-per-minute was initially around US\$ 0.17 (200 Won) per minute, with current prices much lower at US\$ 0.07 (80 Won) a minute. By giving out free handsets, Korean mobile operators were also able to buy phones in bulk, thus reducing their per-unit costs. This combination proved an immediate success in Korea and was part of a much larger plan to export CDMA technologies to the region and around the world.

While the handset subsidization scheme worked wonders for Korea's mobile penetration rate, the Fair Competition Board eventually ruled that the subsidies would have to end. As a result, Korean mobile carriers are no longer allowed to subsidize handsets in order to attract users, though has proved hard to prove whether or not cross-subsidies are continuing. Removal of subsidies does not appear to have caused a major problem, even though the mobile market is approaching "saturation" as users seem willing to pay large sums to upgrade their phones with the newest features. This is strikingly evident in the high turnover rate at which Korean mobile users upgrade their handsets.

While the subsidization of CDMA phones is over, some are calling for the re-introduction of the program, this time to help spur W-CDMA adoption. The question Korean policy-makers are facing though is how strongly they should push the W-CDMA technology. By giving handset subsidies on W-CDMA phones and outlawing them on CDMA2000 handsets, the Government would essentially be promoting one technology at the expense of another. No decisions have been made yet but policy makers are being very cautious not to cook the golden goose.

3.3.3 The mobile triangle

Certain, individual policy initiatives may have effects on the market but none more so than the underlying relationship between the three main branches of the mobile market: the Government, mobile operators, and electronics manufacturers. East-Asian economies, such as the Republic of Korea and Japan, have often experienced incredible growth rates because of a behind-the-scenes linkage between certain sectors of the economy and the Government. These strong ties have also been criticised as helping spur financial crises, such as Korea went through in 1997.

The mobile triangle is made up of three key players: the Government, the mobile operators, and equipment manufacturers. Together the three parts work collectively to promote the mobile industry, through settling on standards, policies, and business models that can help lead to the best possible outcome for all participants.

This behind-the-scenes relationship has been vital in helping establish common standards and services in the industry. As an example, mobile operators must be in close contact with equipment manufacturers to develop new services that users want. At the same time, the Government plays a role by establishing price controls or paving the way with necessary regulatory changes. The triangle is dynamic with all three elements in constant touch with one another.

These relationships have helped Korea move to the front of developed mobile nations. However, these strong ties between the government, operators, and manufacturers also can create conflicts of interest as is seen with the current debate over what the future rollout of W-CDMA will look like.

3.3.4 WIPI

Another key example of Korea's mobile market triangle is tied to the discussion around WIPI (Wireless Internet Platform for Interoperability), a new virtual platform project that would form the base operating system for new mobile applications. Currently, three players make up the Korean market for virtual platforms. These are Korean-based Sinji soft with it's GVM platform, Qualcomm with BREW, and Sun Microsystems with JAVA. Currently, each mobile provider in Korea uses a different platform but providers such as SKT are preparing to open their networks to multiple platforms.

3.3.5 Number portability

MIC has introduced a type of asymmetric regulation in the mobile market, with the dominant operator SKT subject to different regulations than other operators. One area where this has been apparent is number portability, which was introduced at the beginning of 2004. In the first phase, users were only able to take their numbers with them when they moved *away* from SKT to other providers. It will not work in the other direction. This is an effort to protect against a mass exodus from the other providers to SKT's more comprehensive network. The project provoked a high level of interest, with 122'800 subscribers moving from SKT to KTF and another 75'600 migrating from SKT to LG Telecom, all within the first month of availability.

The term "number portability" is a bit of a misnomer for the system in place in Korea. For mobile users, the policy means they can keep their old numbers but subscribe to rate plans from other providers. In reality, users never actually leave their original network. An SKT subscriber who wishes to switch to KTF will still communicate via SKT's mobile towers. However, the user will be charged the KTF rates. The user stays on the SKT network but KTF is put in control of the account. Then, the two providers, in this case SKT and KFT, work out payment for use of the network based on interconnection rates.

3.4 Conclusion

The Korean mobile market is extremely dynamic with operators, handset manufacturers and the Government working to ensure that Korea remains a world mobile leader. Koreans enjoy services on their fast, 3G networks that are unavailable in many countries. Korea's advanced mobile networks and world-class handset manufacturers have also been a key factor in Korea's burgeoning mobile gaming and mobile server industries.

While the Korean mobile network is one of the leading networks in the world, it will not remain in its current form for long. Korea's mobile and broadband networks are quickly moving together towards a broadband converged network, one where fast, mobile data is available anywhere at anytime.

4 The mobile marketplace

4.1 Services and applications

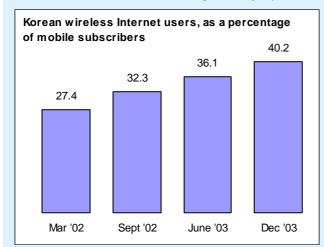
While the mobile networks play a key role in Korea's high mobile penetration rates, it is the services on the network that attract Korean users. Some of the most popular and newest service offerings are discussed below and include wireless Internet, multimedia, m-commerce and mobile gaming.

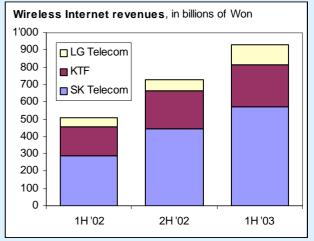
4.1.1 Wireless Internet

Given Korea's broadband penetration rate, it would be easy to assume that Koreans wouldn't have a pressing need for Internet access on their mobile phones. However, Korean's thirst for information makes them high mobile Internet users, despite having broadband access at home and most likely at work. More than 93 per cent of Korean mobile users have access to wireless Internet services, and they generated almost US\$1 billion in the first half of 2003 from doing so (Figure 4.1).

Figure 4.1: The wireless Internet is alive and well in Korea

Korean wireless Internet users as a percentage of all mobile subscribers and wireless Internet revenues.





Note: The methodology for measuring Korean wireless Internet users is based on usage within the last six months. Some 93.5 per cent of mobile handsets are equipped for data usage. In the right chart, one billion Won is approximately equivalent to US\$1 million at March 2005 exchange rates.

Source: KRNIC and Internet Statistics Information Systems (left chart). MIC (right chart).

The wireless Internet is most popular among an interesting demographic group, junior high school students. Students in general use the wireless Internet more than the general public. Indeed, junior high school students have grown up learning on the Internet and face a nearly non-existent learning curve looking up information on a mobile device. This has promising implications for the Korean information society. A whole generation of Internet users will be accustomed to pulling Internet information via their mobile phones.

Koreans use the mobile Internet mostly to search for quick, but important pieces of information. Examples include looking up information on a movie theatre (address and movies playing) or finding a listing of restaurants in a particular area by the type of food that they serve.

4.1.2 M-Commerce

Koreans can use their mobile phones to pay for everything from coffee at a coffee shops, snacks at convenience stores, and large purchases at department stores, either in person or online. The Korean version of m-commerce refers to financial transactions taking place on- and off-line, via mobile terminals. Mobile phones on Korean CDMA networks don't use a SIM card, as on GSM networks, that could be used to store credit card information. Therefore, mobile phone manufacturers, at the request of mobile operators, have built in smart-chip slots on phones that can be used for specialized services. Information from these chips is transmitted in two ways, either via the IR port on the top of the phone or by using radio frequencies. In order to facilitate mobile commerce, credit card companies and mobile network carriers formed an alliance and began issuing credit cards into the subscribers' handsets. One of the tangible benefits is that the service can be used as soon as the credit card company issues the wireless credit card to the phone, immediately after the credit check.

All three mobile operators in Korea have m-commerce services. SKT's "Moneta" service has over 1 million subscribers, KTF's "K-merce" service has over 500'000, and LG Telecom's "Zoop" is also quickly expanding its services. There are more than 470'000 locations nationwide that will accept m-payments²⁰ (see Box 4.1 for information on SKT's m-commerce solution, Moneta).

Box 4.1: Paying for everything via mobile phone

How mobile phone may make credit cards a thing of the past in Korea



When Koreans stop in for snacks at the neighbourhood convenience store, they don't need to bring any money with them. All they need is their m-commerce enabled mobile phone. SK Telecom's Moneta service has more than 470'000 terminals around the country that will accept payments via RFID chips embedded in mobile phones. Users simply wave their phone in front of the Moneta receiver placed next to the cash register (see image). The purchase is then assigned to the mobile user.

Users can also use their mobile phones to pay for public transit. They simply scan their mobile phone over the receiver and the money is debited

One reason that Moneta has been so successful is because Moneta terminals were first installed in another branch of SK's businesses, petrol stations.

4.1.3 Mobile banking

In addition to point of sale transactions over mobile phones, operators have introduced mobile banking services to subscribers. SKT's Network Money (NeMo) service takes advantage of multifunctional smart chips to store online banking information securely and allow users to make payments to others over their mobile phones. The end of the month in Korea is usually a very busy time at banks when users queue up to make payments. However, with mobile online banking, users can transfer money through mobile settlement banks in a near, real-time transaction.

Mobile phones have become one of the favourite methods for making payments, as is shown by the doubling of mobile banking transactions between 2002 and 2003. In December 2003, Korean mobile users checked their balances, or made a banking transaction, 2.56 million times. That is more than double the amount in December 2002 of 1.1 million.²¹

4.1.4 Video services

Video services over mobile phones have been a huge success in Korea. Perhaps *too* successful in fact. Initial video-on-demand offerings by SKT were so popular that the mobile network ground to a near halt in 2003 with the huge amounts of traffic when the service was initially offered without volume limitations

SKT experiences with video services over mobile networks have provided a lesson for all operators in Korea. Video may still end up being a huge mobile driver but it will be in a different form. Rather than users accessing video on demand, mobile phone manufacturers have built terminals with miniature television tuners in them. This allows mobile subscribers to watch terrestrial broadcasts on their phones, regardless of how close they are to a traditional TV. Since the tuners pick up over-the-air signals there are no bandwidth or other charges to users (see Box 4.2).

While video-on-demand has long been seen as a "killer application" for mobiles and broadband, it may not become a reality until there is a substantial leap in bandwidth and streaming capacity, and/or compression technology. While mobile networks may struggle with limited bandwidth, mobile phone manufacturers are already looking towards a different model of video provision. They are embracing the digital media broadcasting (DMB) as a way of delivering video to mobile devices. With DMB, a mobile phone or PDA essentially becomes a receiver for satellite subscription television. Just like home satellite dish users, mobile phone and PDA users will be able to subscribe to services and watch broadcast programs on the move. Service providers are planning on offering a flat-rate service due to the simple economies of "broadcast" television. DMB will be one of the key movements towards convergence of mobile and broadcasting towards "ubiquitous" networks, which can be accessed "anytime, anywhere, by anyone, from any device".

Box 4.2: TV on a mobile phone

There is no more need to miss out on a favourite programme when stuck on public transportation

Koreans are big fans of television programmes and many people follow their favourite singing stars on the evening variety shows on a regular basis. It makes sense then that Korean's would be interested in watching their favourite shows while away from a standard television set. The major broadcasters already show their programming over the Internet but a new generations of phones is bringing over-theair television reception to the handset.

For instance, Samsung's SCH-X80 has a built-in TV tuner that receives TV broadcasts directly from terrestrial towers free of charge. While the world waits for a video-on-demand model to be worked out for mobile data, Koreans can already be watch their favourite programmes via mobile phone.



Source: http://www.etechkorea.info/articles/20030616001.php.

4.1.5 Mobile gaming

Most of the mobile world passes time tapping SMS messages but Koreans are playing games, lots of them. At any time of the day on the subway in Seoul, Koreans of all ages quietly tap away at their phones. Mobile gaming is becoming a major source of revenue for Korean mobile operators. In September 2002, operator revenues from mobile gaming surpassed that from ringtones and screensavers.

Users download games from their mobile operator's game portal into the memory of their mobile phone. Games are typically 120K and common phones can store at least 10 games at a time. The games are essentially mini-applications that run on a "game platform" on the mobile phone operating system. The most popular mobile game in Korea is a "business game" called *Boong-o Bbang Tycoon*. *Boong-o Bbang* are fish-shaped pastries that are available all over Korea from street vendors. In the mobile game, users run a *Boong-o Bbang* business, deciding how many "fish" to make and when to produce them. Since the fish must always stay hot, the user must make well-timed decisions in order to make money in the game. *Boong-o Bbang Tycoon* and other mobile games cost an average of 2000 Won (US\$2). In addition to the cost of the download, users must pay "packet fees" to the mobile provider for Internet usage of around 600 Won (60 US cents).

Each mobile operator in Korea uses a different game platform so game manufacturers create the game once (usually in C or C++) and then "port it" to each of the different game platforms. SKT runs a Korean game platform "GVM" from SinjiSoft. KTF uses "Brew" from Qualcomm, while LG uses "Java" from Sun Microsystems. The Korean Government has been interested in harmonizing the platforms across providers by requiring them to use a government-sponsored version called WIPI (Wireless Internet Platform for Interoperability).

Online games have turned out to be a success for the entire mobile value chain, with all segments of the market taking a share. An example is SKT's arrangement with content providers and its game platform provider. When a user purchases an online game, 85 per cent of the revenue goes to the content creator or provider (e.g. Com2Us). Next, 5 per cent of the revenue goes to license the game platform (e.g. SinjiSoft). Finally, SKT takes a 10 per cent share to cover costs of hosting, and promoting the games on its portal. In addition, SKT bills users separately for data charges incurred through downloading the game.

One of the reasons Korean gaming has become so popular is the game providers are Korean and can cater to local tastes and culture. One of the most popular games for female subscribers is "Go-Stop", traditionally a very popular Korean card game among older Korean men that has found a new niche.

Interestingly, mobile game usage is equal among men and women. What is different is the *type* of games they download. Women prefer more "casual" games while men prefer more "action" games. Whatever the genre, more games are appearing for Koreans every day since a typical game takes only three months to develop.

The majority of mobile games on the market are individual games. However, mobile operators have requested more role-playing games (RPG) from game developers as a way to boost revenues. Individual games are only downloaded once generating only a one-time payment to the operator. However, RPGs typically require a connection to the network to interact with other players, providing a lucrative stream of revenues to mobile operators. That creates dilemma for mobile RPGs. Game developers are hesitant to develop more RPGs because they don't sell well—due to the high data costs of playing them. They realize the games would be much more popular if flat-rate connections were available. Operators, on the other hand, don't want to move to a flat-rate data plan for gaming as it would cannibalise the revenues of extreme gamers who are currently willing to pay high costs to play.

4.1.6 Music

Music is deeply engrained in Korean culture. Koreans love to sing and music touches Korean's daily lives. It is therefore fitting that new technologies embrace music as a way to promote their services. Korean phone manufacturers were among the first to introduce polyphonic ring tones to give a more pure musical sound to mobile phones. Korean phones can reproduce 64 phonics (or different notes) at one time and this is now setting the standard for the rest of the world as Korean-manufactured handsets become more popular (see Table 4.1).

Korean content providers are making good use of the improved technology in several ways. Noraebang (Karaoke) programs and associated music files are among the most popular downloads.

Korean operators have also built new music services into interesting business ideas. While ringtones change the way a mobile phone rings to the subscriber, new services allow Korean subscribers to change their "connection tone", how their phone rings to the *caller*. That means instead of hearing the traditional telephone "ring-ring", the caller can actually hear an audio clip such as music or simple narrations. The Korean company DANAL provides connection tones for all three mobile providers under the names Coloring for SKT, Feeling for LGT, and Ring4U for KTF.

In addition to changing how the phone rings for the caller, new mobile services can also play music softly in the background while users talk.

4.1.7 Other services

The mobile Internet, multimedia services and games are only a part of the total services available to Korean mobile subscribers. Several other interesting applications are becoming popular among users. These include:

- Mobile call caching. New services available from Korean mobile providers allow subscribers to receive an SMS of all missed calls while their mobile phone was turned off or out of reach of the network. Traditional call logs were compiled at the handset level, meaning that if the handset were powered off or off the network, the list of callers could not be provided. However, a Korean mobile server provider, FeelingK has built a system that transfers call information at the server level to mobile users when their phones reinitiate contact with the network.
- *E-lottery*. Another popular mobile service in Korea is the lottery. Instead of buying lottery tickets from the local store, Koreans are able to play the lottery online. This has been a huge boon for mobile operators with operators taking a percentage of all tickets purchased via mobile handsets. The ease of play has greatly increased user participation in the lottery, with several groups claiming it is fuelling gambling addiction.
- *E-books*. Korea's Confucian emphasis on education can help explain the importance of books in Korean society. It is therefore natural to see books as a popular download for mobile users. Koreans can download e-books onto their mobile phones for a typical price of US\$ 6 (7,000 Won), representing a discount of nearly 40 per cent off the cover price for the paper version. The book's

text can be read straight from a mobile phone. Com2Us is one e-book provider and shares revenues with Booktopia, the collective licensing scheme. Some 60 per cent of the revenues go to the authors through the collective scheme while the remaining 40 per cent stays with Com2Us.

4.2 Terminals

One of the key reasons new services have become so popular in Korea are the high-tech terminals produced by Korean manufacturers and quickly put into circulation by Korean mobile providers. Korea is well known for its flashy, cutting-edge terminals produced by the leading manufacturers Samsung and LG.

Korea's large domestic market has allowed Korean manufacturers to gain expertise and economies of scale sufficient to expand quickly into world markets. Korea's mobile handset operators have been able to leverage their technological know-how in CDMA to also become leaders in GSM technology, even though there are no GSM networks in Korea. Samsung and LG produce both CDMA and GSM handsets, with the GSM terminals built exclusively for exportation. Samsung is the world's number two manufacturer of GSM phones, just behind Nokia. Like LG, currently in fifth place worldwide, it has increased market share recently (see Table 4.1). Korea also has several other handset manufacturers including Telson, and Hyundai/Curitel, although they have yet to gain a significant market share.

There are several interesting trends in the Korean handset market. First, the distinction between mobile phone and personal digital assistant (PDA) is fading as the two devices converge. Second, handsets are becoming larger to include more features and bigger displays after a long spell of shrinking sizes. Third, users are upgrading their handsets ever more. Some estimates indicate that users upgrade their handsets every eight or nine months.²²

Table 4.1: Worldwide mobile handset sales to end-users, 3Q 2004

With the growing market share of Korean manufacturers highlighted

Company	3Q 2004 Sales (thousands)	3Q 04 Market Share (%)	3Q 03 Market Share (%)
Nokia	51'695	30.9%	34.2%
Samsung	22'981	13.8%	11.2%
Motorola	22'393	13.4^	14.7%
Siemens	12'758	7.6%	9.1%
LG	11'142	6.7%	5.3%
Sony Ericsson	10'683	6.4%	5.3%
Others	35'417	21.2%	20.2%
Total Market	167'070	100.0%	100.0%

Source: Gartner, http://www4.gartner.com/press_releases/asset_115121_11.html.

4.3 Conclusions

One thing that has become clear in the Korean market for mobile phones, is that users are demanding more from their phones—in terms of services and applications—and are willing to settle for larger sizes as an exchange for functionality. As the number of features increase, the number of devices Koreans must carry falls. As a result, many are predicting that devices with extensive functionality (like the Samsung MIT 400) will be the wave of the future.

It is also clear that the Korean marketplace has shown remarkable responsiveness to users' appetite for services to be accessible on the move. This is what makes the quest for ubiquitous networks such as tempting prospect. The role of the Government policies in promoting a vibrant environment for operators, service providers and manufacturers is also an inextricable part of the mobile-friendly marketplace that today exists in the country.

5 Towards ubiquitous, converged networks

5.1 The Korean vision: The "Broadband Converged Network"

The boundary line that formerly distinguished Korea's highly developed broadband and mobile networks is fading. In one direction, broadband connections are becoming mobile with extensive Wi-Fi (e.g. KT's Nespot) and soon WiBro networks. At the same time, mobile phone technologies are starting to reach broadband-type speeds, as EV-DO comes more widely available and as W-CDMA services are launched. Convergence is nigh and the new Korean network will likely be one of the first of its kind in the entire world. Convergence will mean that Koreans have seamless access to fast, robust information wherever they happen to be in the country.

As a result of Korea's leading role as an Information Society, it is important to understand the nature and implications of this newly converging network. Other developed countries will likely be following the lead of Korea, implementing everything from Korean equipment (hardware components and handsets), to policy lessons pulled from the Korean experience. This section will examine the Korean vision of a ubiquitous converged network and how that vision is currently becoming a reality. It will also look at particular government programmes designed to promote this vision (see Figure 5.3).

5.1.1 What is a broadband converged network?

The Korean mobile and broadband networks, while both very advanced, have evolved separately and are quite different in their composition, network architecture, and business models. Therefore, it should be no surprise that there is no "exact" picture of what the future network will look like. The Korean model has had to be dynamic to reflect the merger of two very dynamic Korean telecommunication sectors. Even the official name of the new network has undergone a series of transformations, currently settling on "Broadband Converged Network" (see Box 5.1).

Korea's National Computerization Agency (NCA) has defined the BCN as

"A Next Generation integrated network that is accessible anywhere without any connectivity problems while offering top-class security for quality streaming of broadband multimedia services in an info-communications environment that embodies the convergence of fixed line and wireless networks."²³

The complex nature of NCA's definition mimics the inherent complexity of a converged network; it is more than simply a merger between broadband and mobile technologies. The converged network will also include terrestrial and satellite video broadcasting (TV). The BCN should be one massive, fast IP network connecting users to all kinds of information and should, at the same time, be able to adapt and integrate other new forms of information easily (see Figure 5.1).

Combining so many different information sources together creates many technological and political challenges. This section will first spell out what the ubiquitous, converged is likely to look and what services will be available with when completed. Next, the section will look at the technical issues of how these networks can interact with one another. The final section will look at policy implications of a converged network and what the Korean Government has done to facilitate the development of the ubiquitous network society.

In order to fully understand the BCN, it is important to understand where different network elements fall into place in the wider scheme of "total connectivity." The BCN is being touted as one massive IP network to which Koreans can connect from a wide range of terminals and from nearly all locations (see Figure 5.1). In order for society to achieve the goal of total connectivity, the network must use many different technologies, some of which are more suited to certain environments than others. In essence, different services and activities are optimally provided by different types of connectivity, and the BCN should leverage each technology's comparative advantage. For example, video streaming of movies to a household is best done over the broadband, wired network while mobile telephony in the subway may be most efficient over the existing mobile networks. The key is then ensuring that each of the disparate networks can communicate with each other and pass traffic between themselves via IP.

Network-specific services (e.g. SMS) should move away from being solely a mobile technology and should be accessible via any IP-enabled terminal. This creates the need for new network architecture. The BCN will demand an entirely different type of network plan that involves building a third type of data service.

Box 5.1: What's in a (converged network) name

The difficultly of naming an ever-changing network.

The Korean Government has been planning for a converged network for a long time but has remained flexible enough to incorporate modifications as the process develops. One place where this dynamic has been apparent has been the naming of the new converged network. Currently the official name is "Broadband Converged Network" but it has gone through an evolution reflecting developments in the mobile and broadband sectors.

1. Next Generation Network (NGN)

The first phase of planning was focussed on building a "next generation network", by developing both the mobile and broadband markets. Policy-makers envisioned this next generation network eventually meshing mobile and broadband technologies but the name seemed to put less emphasis on a future convergence than on upgrading existing mobile and broadband networks separately. The two parts, while similar, would still need to develop under their own, specific plans. NGN has latterly come to be widely used within ITU-T circles as a focus for future standardization work.

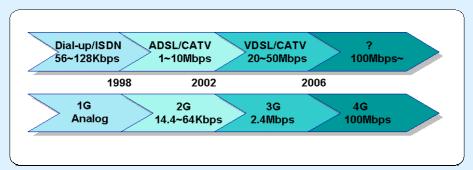
2. Next Generation Converged Network (NGCN)

As mobile and broadband technologies were developing at such a rapid pace, it became apparent that the vision of convergence could happen sooner than some had expected. This gave way to a stronger focus on the "convergence" of the future network, a focus that has only become stronger over time. When policy-makers use the word **convergence** they are referring to a move towards **a single large network**.

3. Broadband Converged Network (BCN)

Korea's mobile network is one of the leading networks in the world but its broadband network is by far, the most developed in the entire world. It is, therefore, natural that the converged Korean network should have an emphasis on broadband, to show off its strongest assets. This is reflected in the newest iteration of the network's name. It was also the title of a recent ITU/MIC symposium, held on 3 March 2004.²⁴ A possible timeline for achieving the BCN is indicated in the Figure below:

Box Figure 5.1: Korea's BCN timeline



4. Beyond the BCN: IT 839 Strategy

Perhaps conscious of the impossibility of capturing so many complex concepts in a single overloaded phrase, MIC Korea has positioned the BCN as one of three "infrastructures" supporting the so-called IT839 strategy (see Section 5.4 and Figure 5.3).

Regardless of the current or final name decided for the converged ubiquitous network, the transformation is continuing at a rapid pace. Whatever the final name, the network should be a world-class telecommunications infrastructure connecting Koreans to information everywhere, from anywhere.

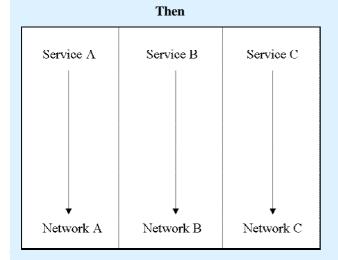
Source: ITU/NCA.

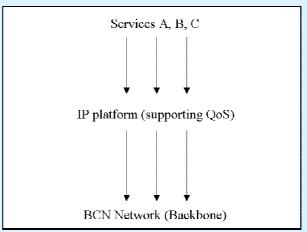
5.2 Korea's revolutionary network plan: The Portable Internet

In many countries, mobile operators have envisioned being able to encroach on the fixed-line broadband market through their 3G and eventually 4G offerings. Likewise, broadband providers have been eyeing mobile data provision, until now the domain of mobile carriers, by using WLAN technologies such as Wi-Fi. However, neither broadband nor mobile operators are perfectly suited for offering fast, mobile data. Broadband networks are too stationary since Wi-Fi and other WLAN technologies ranges are short and there is no effective handoff ability. This makes it less effective for use in moving vehicles. Mobile networks, on the other hand, don't have enough bandwidth to offer truly high-speed, broadband-type connectivity, as was highlighted by SK Telecom's experiment with video-on-demand on its CDMA network.

Figure 5.1: The move towards one network, many services

The Korean vision of the BCN can be broken down into "then and now" network services. In the left image, different services are each provided by different providers on their own networks. BCN will change this and combine all networks into one large IP network. Then, the same services will be available to all users, over IP, regardless of from which part of the network they connect. As an example, users could configure their Internet enabled refrigerator via broadband, their mobile phone, a PDA, or any other connected terminal





Source: KT and ITU.

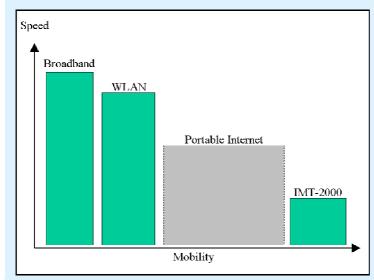
Korea's policy-makers, broadband providers, and mobile operators have therefore come up with a plan to develop a new data network that is more efficient at offering mobile data than either broadband or mobile. This plan is called WiBro, or "the Portable Internet". The Portable Internet is a technology that fits well between WLAN and IMT-2000 in terms of mobility and speed (see Figure 5.2, left). It would offer a 1 Mbit/s connection to users for a flat monthly fee. The three licensed operators have not said how much they will charge but industry watchers assume the prices will be about US\$ 15 per month, for flat-rate access.²⁵

The strategies of the three licensed operators for the 2.3 GHz plan vary:

- KT, for example, has already introduced a "seamless" offering through its Nespot Swing, a bundled package that where users can roam between its own Wi-Fi hotspots and its competitors' CDMA2000 1x EVDO networks, when out of Wi-Fi range. WiBro will allow them to take this latter traffic onto their own network;
- The Portable Internet promises to further expand SKT's network in a more cost-effective manner than relying on CDMA alone. Because of their limited bandwidth availability, CDMA networks are only cost effective for voice and non data-intensive applications.
- For Hanaro Telecom, WiBro offered a chance to fight back against its loss of market share and traffic to mobile operators, as well as a chance to become a "mobile" operator itself. However, once the first payment was due, it decided to relinquish its licence and focus on the fixed-line broadband market.²⁶

The portable Internet has several advantages over WLAN and IMT-2000 for delivering data. While Wi-Fi is limited to a range of roughly 100 meters, WiBro will be accessible in a 1 km radius around a base station and be accessible at speeds around 60 km/h (see Figure 5.2, right). WiMAX will be accessible over a much greater range, though probably not from fast-moving vehicles. Mobile carriers are especially interested in Portable Internet technologies because of their significant investment in cell towers throughout the country that can quickly be leveraged to offer Portable Internet. This upgrade can be effectuated simply by adding a second set of radios on the towers.

Figure 5.2: Portable Internet technologies, including WiBro, could fill the speed and mobility gap



WiBro at a glance		
General		
Frequency:	2.3 GHz	
Licenses:	3 awarded (Feb 2005)	
Bandwidth		
Per user:	1-2 Mbit/s	
Total:	100 MHz	
Maximum accessible speed for users:		
Practical:	60 km/hour	
Theoretical:	250 km/hour	
Pricing estimates		
Monthly unlimited use:	Flat rate, est. 15 USD	

Source: "ITU Internet Reports 2004: The Portable Internet", available from www.itu.int/portableinternet.

Portable Internet technologies, as envisioned, could handle the a majority of mobile data traffic while voice calls will be routed over the existing CDMA, and W-CDMA networks. This plan leverages the comparative advantages of each technology and allows Koreans an effective way to have fast data access everywhere.

However, Portable Internet technologies can also, relatively simply, accommodate voice over IP traffic streams, and in this sense would compete more directly with existing mobile networks. In this sense, the fixed-line operators, like KT and Hanaro, are positioning themselves to offer services, like KT's "One-Phone", which provides users with a telephone with a unique number that can be used on both fixed and mobile networks, and will automatically route via whichever link is cheapest for a particular call (e.g., jumping onto a fixed-line network via a Bluetooth, WiFi, WiBro, WiMAX, 3G or 2G interface)

Korean handset manufacturers are also interested in portable Internet technologies as a stimulus for their products. Manufacturers such as Samsung and LG will build multi-band phones that work on a variety of networks. Future mobile handsets, like KT's "One Phone" may have the ability to access the different types of networks: CDMA2000 1X, W-CDMA, Wi-Fi, and portable Internet technologies. Both Samsung and LG make it clear that the technology for building these multifaceted handsets is currently available but they are simply waiting for word on how the network will evolve before building in portable Internet functionality.

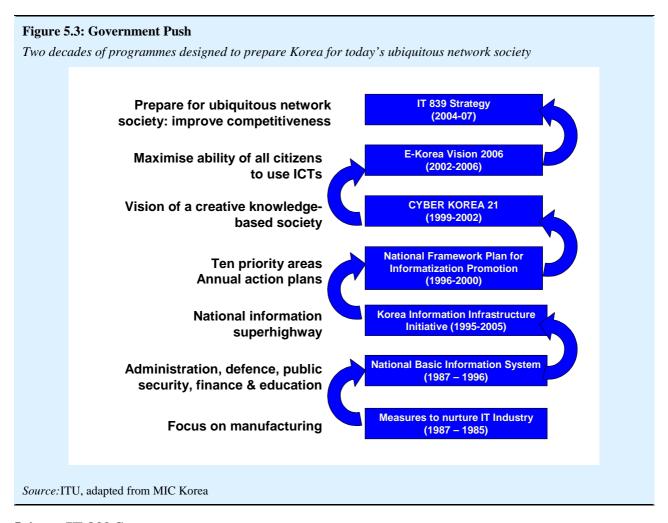
While the different telecommunication entities in Korea may agree on a need for the portable Internet in Korea, there is less harmonization in the actual design of the network. Korea's ETRI has developed a plan for the Portable Internet known as HPI, while other groups are pushing for slightly different standards. The final decision on the makeup of the portable Internet should be made in 2004.

5.3 Digital media broadcasting (DMB)

While portable Internet technologies address the need for cheaper mobile data, Korea's broadband converged network will also include a video component known as Digital Media Broadcasting (DMB).²⁸ DMB is satellite television for a mobile phone and addresses an inefficiency inherent in video-on-demand (VoD). VoD has often been cited as a potential "killer application" for broadband and mobile users. The predictions of VoD success have not appeared as of yet though because of a number of problems with the underlying economics of video-on-demand distribution and with the lack of compelling content. Terrestrial, satellite, and cable television use one single stream of a channel to service all subscribers in a given area, making effective use of limited bandwidth. VoD is inefficient because each individual subscriber requires a separate stream from the server. The inefficiencies are obvious when many subscribers are watching the same programme but still require a channel of bandwidth for each. This bandwidth problem will persist until either compression technologies improve drastically or available bandwidth explodes.

In the meantime, Korean policy-makers and telecommunication providers have found a cost-effective and efficient way to bring video to mobile users; they'll broadcast it. Mobile handset manufactures are building satellite television receivers into their new mobile phones as a cost-effective way for Koreans to watch their favourite programmes on the go. DMB pricing plans are flat rate, with costs in the US\$ 20 range per month for unlimited viewing. Flat rate pricing makes sense when the incremental costs of increasing the number of viewers are essentially zero. While users will be stuck to a certain time schedule, policy-makers aren't worried about insufficient demand.

Digital satellite television services have been a huge success around the world, partially because technology has increased the number of channels available to subscribers. Digital satellite television compresses signals to allow for a large number of channels to subscribers. It is not uncommon for subscribers to have several hundred channels available with their subscription in some parts of the world. But the business case for moving this content also onto mobile phone handsets is still unproven. DMB in Korea would allow for subscribers to watch these programs on their DMB-equipped mobile phone or PDA.



5.4 IT 839 Strategy

An important component of Korea's critical path for achieving a ubiquitous network society ("U-Korea"), and for sustaining industrial competitiveness is the so-called "IT 839 Strategy"²⁹. The name comes from the targeted industrial sectors (see Table 5.1). The goals of the strategy are intended to "open the era of US\$20'000 GDP per capita" (in 2003, Korea's GDP per capita was US\$17'650, measured in purchasing power parities). In 2004, the employment generated by these industrial sectors was 1.28 million and projected to grow to 1.44 million by 2007. More dramatically, it is projected that the value of Korea's exports from these sectors will increase from US\$ 75 billion in 2004 to US\$ 110 billion.

Although discredited elsewhere, the policy of "picking winners" through technology assessment is alive and well in Korea, and is being promoted through a partnership between government and the private sector. The strategy contains both specific actions to be undertaken in 2005 and measurable mid-to-long term goals. For instance, for the Home Network Service, the aim is to encompass 1.5 million homes in 2005 and ten million

by 2010. The strategy sets specific targets also for Korea's international competitiveness, such as achieving a minimum 5 per cent global market share in RFID chips by 2007 or being the second largest global producer of embedded software by 2010.

The technologies and sectors chosen underpin the achievement of the ubiquitous network society. This is particularly evident in the case of the three highlighted infrastructures. The case of the BcN is described above. Korea aims to have the world's first fully-integrated BcN by 2010, serving some 20 million users at speeds of 50-100 Mbit/s. The U-Sensor network is intended to connect RFID chips and U-Sensors to the BcN and to create an "internet of things" by 2010. It is projected that a U-Sensor test centre will be established in 2005 and that chip prices will be below 10 US cents per chip by 2007. Similarly, the development of an all IPv6 network by 2010 is essential to this vision. Korea's allocation of IPv4 addresses is expected to be depleted by 2006. IPv6 will be implemented straight away in pilot projects, such as WiBro and home networking.

Table 5.1: The components of IT 839

The industrial sectors making up Korea's IT 839 strategy

8 services	3 infrastructures	9 new growth engines
WiBro Service	Broadband Convergence Network (BcN)	- Next-Generation Mobile Communications
DMB Service	Ubiquitous Sensor Network	Digital TV
Home Network Service Telematics Service	(USN)	Home Network
RFID based Service	• Next-Generation Internet Protocol (IPv6)	IT System on Chip
W-CDMA Service		Next-Generation PC
Terrestrial Digital TV		Embedded Software Digital Contents
• Internet Telephony (VoIP)		Digital ContentsTelematics
		Intelligent Service Robot

Source: MIC Korea, "U-Korea: IT 839 Strategy", at: http://www.mic.go.kr/eng/res/res_pub_it839.jsp.

5.5 Technical issues

Merging separate broadband, mobile, and video networks is a daunting task and there are several technical issues that need to be resolved for the BcN to function smoothly. These include mobile gateways, IPv6, and ENUM. Some of these have been or are currently being deployed while others are in planning stages.

5.5.1 Mobile gateways

One key element of a converged network is the ability of all devices to talk to each other on the network. This has been difficult in the past due to the closed architecture of mobile networks. However, the Korean Government quickly realized that mobile devices needed to be able to access Internet content while Internet terminals should also have access to data on the mobile networks. Gateways play a key role in the merging of mobile and broadband networks in Korea. A Gateway is networking hardware that passes information back and forth between different, privately owned networks. Gateways are an integral part of broadband backbones because they "piece together" all the smaller networks to form the Internet. Mobile-broadband network gateways have been much more difficult to put into place because of resistance from mobile providers that have preferred to keep control over content on their networks.

Currently, wireless data users in Korea must use a special prefix (e.g. 1501) to access the Internet from a mobile phone. However, the Government has recently initiated a mobile exchange, similar to Internet exchanges that pass Internet traffic from one network to another. The Government has mandated the use of the exchange by all carriers, as a way to push quickly towards a single network (see Box 5.2). What remains to be worked out is an accounting method for paying for traffic exchange. In the traditional Internet, large

"Tier 1" carriers usually pass information back and forth without charge for other Tier 1 operators, since traffic flows work out to be roughly equal, in and out of the networks. However, the higher costs of data traffic on mobile networks will make the ultimate decision on how to pay for traffic a much more difficult issue for the regulator and businesses to work out.

A common exchange will also change the way content is delivered to mobile users. Content providers were commonly pressured to offer exclusive services to just one carrier. A common fixed-mobile gateway would be more efficient because it allows mobile users to freely access content on the Internet and open the way for mobile content competition.

MIC recognized this reluctance on the part of mobile operators to open their networks and mandated the installation of mobile gateways from operators. In August 2003, MIC authorized SKT's proposed gateway plan and will required SKT to open the gateway to both wired and wireless carriers as well as portals and other content providers. The goal of the project is to create competition in mobile Internet content. An Internet portal could create mobile content that could be used on any of the three mobile networks.

Box 5.2: The Korean Government's mandate on mobile gateways

Internet portal and content providers will soon be able to offer their services directly to Korean mobile subscribers over the mobile Internet. MIC has mandated the opening of mobile gateways to facilitate network traffic between the fixed and mobile networks in an effort to expand mobile content provision. Many of the terms between mobile network owners and those wishing to use the network are predefined by the ministry. Examples include:

- 1. Portal and content providers shall request initial access to the network at least one month before the intended date of connection.
- 2. Portal and content providers shall be verified on the harmfulness of their content from verification organization, like content associations, which are designated by mobile carriers.
- 3. Payment to a mobile carrier's billing service may be fixed at between 5 to 10 per cent of the total information fee, based on mutual consultation between parties. To avoid customer complaints on information fees, portal and content providers will be verified on charged and collected information fees from "independent billing verification organizations" as designated by the three mobile carriers.
- 4. Portal and content providers may be provided with information on wireless Internet platforms (WAP GW, billing system, linked standards, etc.), which is essential in the production and distribution of content and services from mobile carriers.
- 5. Portal and content providers may be provided with information on the specifications of the user's handsets (e.g. colour displays and 4/16/64 polyphonic tones) so that the content provider may offer market-specific content and services to its users.

Source: ICA.

5.5.2 IPv6

Koreans envision a broadband converged network where all appliances will be controllable from a wireless phone or Internet terminal. However, this futuristic vision of connectivity will require specific addresses for each device on the network. As noted above, the current Internet addressing scheme "IPv4" may suffer from a shortage of addresses as from 2006, at least if every refrigerator and other electronic device is going to be attached to the Internet. IPv6 is an upgrade to the current IP addressing system on the Internet and Korea is one of its largest supporters. In January 2004, Korea and the European Union signed an agreement to work together to develop applications and services based on addressing system.³¹

There is some debate as to how pressing the need is to upgrade the existing IPv4 system. However, Korea is quickly on track to connect a wide variety of home appliances to the web (see section six for more information). Korea's efforts with IPv6 are especially pertinent given Korea's historical production of consumer appliances. (e.g. LG, Samsung, Daewoo). It may be unwise to underestimate the speed at which appliances will require unique addresses, or their number.

5.5.3 ENUM

On a converged network, mobile phone users will need an effective way to "call" someone who uses an Internet phone (e.g. Voice over IP). VoIP users often don't have phone numbers and instead are contacted via an IP address or some other alphanumeric format, such as that used by Skype. The phone network and

Internet need an effective way to share directories in order to pass calls back and forth. One solution under consideration in Korea is ENUM (named after the technical standardization working group on electronic numbering). ENUM is a method to merge the addressing system on the Public Switched Telephone Network (PSTN) with that of an IP network by "mapping" a telephone number into a typical Uniform Resource Locator (URL). ENUM could help lay the foundation of the Korean BcN by combining two different directory structures, the domain name system (DNS) and the PSTN numbering system, as defined in the ITU-T Recommendation E.164.

The Korean Government has started several successful ENUM trials. A successful internal ENUM trial in July of 2003 has led to a public trial capable of handing over 100,000 users.

5.5.4 Building the BCN: Technology vs. business models

Several issues need to be worked out before the BCN will become a reality. Interestingly, some of Korea's leading telecommunication firms believe the biggest difficulties with the BCN will not be tied to technology, but rather to business models. The technology to move users seamlessly from one network to another is already in place with KT demonstrating Nespot Swing as a viable solution. However, the mechanism for making interconnection payments between respective infrastructures is much more difficult and a process that will take some time to work out.

A particular problem arises in inter-working networks based on flat-rate pricing structure (such as DSL broadband networks) with those based on per-minute or per message charges, such as the mobile phone network. It is likely that the former will prevail, and this is likely to generate considerable resistance, especially among cellular mobile operators. For that reason, portable Internet technologies, such as WiFi, WiMAX and WiBro may offer an easier integration path than cellular networks for the BcN.

5.5.5 Dual-use devices

One area where Koreans will quickly see convergence is in mobile phones. KT is working on development of a "One Phone" network that can be used as a cordless phone at home and a mobile phone outside. The mobile phone will attach to a home or office network via Bluetooth, when in range. This allows it to make use of cheaper tariffs that may be available via a land-line provider. Eventually, the phone could also be used to make calls via VoIP at home or at the office. When users leave the Bluetooth range, the handset becomes a mobile terminal capable of using KTF's extensive CDMA2000 network.

The evolution towards dual-use devices seems natural and offers an initial step towards integration of the two types of telephony. Of particular interest is the use of Bluetooth instead of its 2.4 GHz compatriot, Wi-Fi. Network designers chose to limit the range of the radio technology in order to increase battery life. In addition, the new Bluetooth standard incorporates quality of service (QoS), something missing in Wi-Fi but important for continuous voice communication. Perhaps, too, the fear that a voice call that interfaces with the network via WiFi would continue its journey via the Internet rather than via the PSTN is another reason for reluctance to promote WiFi.

Network operators have already built similar services into their product lines. Large groups including corporations and universities can make special arrangements with mobile operators to have all calls between users in a certain cell free (like a PABX). This cell can be located in a building or on a campus. Once outside the cell, users then are charged normal mobile phone rates (see Box 5.3). The success of the service depends crucially on having a single phone number that can be accessed, irrespective of location.

5.5.6 RFID and Sensor Technology

Another area where ubiquitous technologies are evolving fast is in radio frequency identification (RFID) and universal sensor networks (USN). Research in these field is being coordinated by ETRI.³² In 2004, the Korean government allocated spectrum for RFID/USN in four bands:

- 135 khz, mainly for access control applications (e.g., smart key passes);
- 13.56 MHz, for smart cards and inventory management;
- 433.67-434.17 MHz, where applications include inventory management and tire pressure sensors;
- 908.5-914 MHz, for applications in the logistics and distribution fields.

RFID and USN are identified respectively as a key service and infrastructure for the IT839 strategy. To this end, six pilot programmes have been launched within Korea's public sector as a testbed for these technologies:

- Sept. '04 May '05, Government procurement management using RFIDs;
- Sept. '04 April '05, Ammunition management using RFIDs by the Ministry of National Defence;
- Sept. '04 April '05, import/export logistics infrastructure using RFIDs, by the Ministry of Commerce Industry and Energy;
- Sept. '04 April '05, an imported beef tracing service using RFIDs, launched by the national veterinary research and quarantine service;
- Sept. '04 April '05, an airport baggage tracking service, by Korea Airports Consortium;
- Dec. '04 August '05, an RFID-based harbour efficiency improvement scheme, launched by the Ministry of Maritime Affairs and Fisheries.

A similar range of pilot programmes have been launched in the private sector, including in wholesale and retail, medical and parking applications.

5.6 Policy implications

Korea's move towards a ubiquitous network based around the BcN has several important policy implications, including how voice traffic will be regulated, which operators are allowed to own which networks, and interconnection rates. The success of the BcN will likely rest, to a large extent, on the policy decisions made now.

Box 5.3: Samsung's converged fixed and mobile phones

Internal calls are free within the building but are charged at 3G network rates outside.

At Samsung headquarters in downtown Seoul, every desk has a wired, landline phone, even though they aren't necessary. Samsung is taking advantage of a new trend in business mobile technology offered by Korean mobile providers: mobile handsets that become part of the Wireless Private Branch eXchange (W-PBX) inside company buildings. Company-issued mobile phones attach to the internal Samsung network while inside the headquarters and switch to the regular CDMA network when outdoors.

This new and interesting business model in Korea essentially installs a mobile cell inside the building. All calls that stay on the same local cell (in the building) are free and are not billed to the users. Internal calls are patched through the company PABX so users only need to type the last four digits of the phone number to reach another employee.

Mobile operators are betting that the business model will increase revenues. First, by signing up companies to the plan, the mobile carrier effectively wins all that company's employees to its service. Second, as users become more accustomed to doing business via the mobile phone instead of a desktop model, carriers are hoping that more business will eventually take place out on the CDMA network, where users are still billed.

There is a certain psychology to the usage of different networks: because fixed-line telephone tariffs were traditionally cheaper than using a mobile, calls made over that network are longer in average duration. By giving users the same phone for use on both mobile and fixed-line networks, mobile carriers are hoping that the loquacious habits of fixed-line users will spread (perhaps sub-consciously) to their usage of the mobile network.

Source: Samsung, SKT.

5.6.1 Voice

In a converged network, there may less economic incentive to have extensive overlapping areas of network coverage. It is predicted that the BCN will economically reward telecommunication carriers specifically for concentrating service in the areas where they have the clear advantage. With the advent of the portable Internet as a cheaper alternative for mobile data, IMT-2000 networks may lose their competitiveness in terms of providing mobile data, a key selling point of 3G technologies. This will be compounded if the

portable Internet includes flat rate pricing for data, eventually leaving CDMA networks transporting mainly voice.

However, if one mobile network is better at handling data than another, the distinction between data and voice could become trivial. As has been shown by the explosive growth of voice over IP, data traffic tends to find its way to cheaper transport channels. Handset manufacturers could include voice over IP software on their terminals that could bypass the CDMA network completely for a monthly flat rate. This leaves the Government in the awkward position of deciding whether to regulate different types of data traffic flowing over the new network; a decision most regulators would prefer to avoid.

The regulatory implications for voice traffic will be significant. Traditional regulatory schemes involving universal voice service may be different on a large data network. With VoIP, voice calls are handled alongside other data. It becomes difficult for regulators to apply different regulations to voice than to other data on the network.

In October 2004, the Korean Government allocated "070" as a prefix code for VoIP numbers. This will be an important step since it allows users on any IP device to make and receive calls. Instead of using separate prefixes for mobile and fixed line phones, VoIP prefixes would be device independent. This means that a user on the road would be able to be reached via VoIP on their PDA via the portable Internet, but the same call could also reach them at home via their broadband connection and a VoIP application. According to some estimates, VoIP traffic is growing by 40 per cent per year in Korea.³³

VoIP also introduces other complications to current regulatory schemes. Currently, KT and SKT are considered the dominant providers in the fixed line and mobile markets respectively. However, in a BcN, the market definition is likely to expand. KT and SKT could become closer substitutes to one another and the Ministry must necessarily reconsider what is defined as "dominant".

5.6.2 Universal service requirements

Universal service requirements have long been a staple of voice telecommunication policy but have been relatively rare in data service provision. Korea is one of only a few countries to mandate universal service requirements for broadband, something many other countries are watching closely. The Korean Government sold its final *tranche* of shares in KT in 2002 on the condition that KT would be required to offer broadband to remote villages. At the time, broadband was determined to be a 1 Mbit/s connection.

The Korean trend is to move more towards requiring universal data services, rather than one specific data technology such as voice. Regulators are hoping that if an area is covered by broadband data, voice service becomes a given.

In a truly "converged" network, there should be no differentiation between the type of technology used to access the network. In reality, universal service coverage covering simply "data provision" may not be sufficient for outlying areas. The Korean vision of the BcN employs four separate technologies to "fill the gaps" of high-speed coverage. Users in highly populated areas such as Seoul could very likely have access to all four technologies at any given moment. However, users in outlying regions (e.g. some of Korea's outlying islands) will only have limited access to one to two of the four networks. Universal service requirements will therefore need to be explicit about what types of data coverage may be required and if one or two technologies will be sufficient.

5.6.3 Competition policy

Another area that Korean policy-makers must address is competition policy. Current competition policy disallows the ownership of more than one type of network. This may hinder development of the BcN. Competition issues will arise over what kind of networks operators are allowed to own. With broadband, WLAN, the Portable Internet, and mobile networks all offering data services via different technologies, Korean policy-makers must decide if operators will be able to own all four types of network or whether there should be certain limitations.

5.6.4 Interconnection rates

Data should be able to flow freely over the BcN, regardless of where the data request originates and where it ends. The behind-the-scenes transfer will likely happen over several networks, owned possibly by several providers. Good interconnection policy will be vital to ensure that the system works as planned.

The difficultly in setting interconnection rates for a BcN begins with the different cost structures for different networks. Mobile networks have the highest costs per packet of transferred data while high-speed broadband fibre-optic networks incur near zero costs per packet. Mobile operators will need to be compensated more for data use on their networks than fixed line broadband providers. Interconnection rates will also form a key part of any future business models.

In conclusion, consumers will most likely benefit from the introduction of another competing network. The costs of mobile data transmission should fall considerably as the new network offers large increases in data efficiency. Also, services on each of the four disparate networks may also improve as broadband providers, mobile operators, and Wi-Fi service providers can put more emphasis on specializing their products, rather than spending to vastly increase the reach of their network. Finally, as these networks converge, users will likely subscribe to one "network" data service that connects then regardless of location. Movement between the "different" networks should become seamless and opaque to users as the handoff technology improves. Indeed users will access "one network" via different, seamless technologies.

6 The Korean ubiquitous network society

Koreans can be said to be swimming in information. The amount of information available to Koreans at any time of any day from anywhere can be overwhelming. Smart phones, PC Bangs, and even broadband-equipped restaurants all constantly beckon Koreans to keep in touch with information. This vast access to information seems to go hand-in-hand with Korea's *bbali bbali* culture. Everything is a rush to be more productive and save time. Mobile networks, both current and in planning, have greatly expanded productivity and freed up more time for Koreans to work. However, *bbali bbali* also has some drawbacks. In Korean society, people often can't (or don't) take time to relax, disconnect, and enjoy. Even leisure activities, like gaming, are taken at a frantic pace.

Korea's burgeoning of information has both benefits and drawbacks. The success of Korea's ubiquitous network society will, to a great extent, depend on the resulting balance. As a result, Korea mobile users, policy-makers and telecommunication providers are working on finding a healthy amount of connectivity. What is clear is that Koreans will need a way to "unplug" from information when they want.

This section will look at some of the social factors affecting the development of the ubiquitous network society in Korea. First, it will look at the possible benefits to users, the economy, and service providers. Second, the section will examine a few of the drawbacks and pitfalls of living in the Korean ubiquitous network n society, along with programmes and plans to overcome them. Third, the section will examine a few ways Korean culture has changed and adapted to the new society. Finally, the section will attempt to look forward to how the ubiquitous network society will change in the next few years.

6.1 Social benefits

6.1.1 Anytime, anywhere

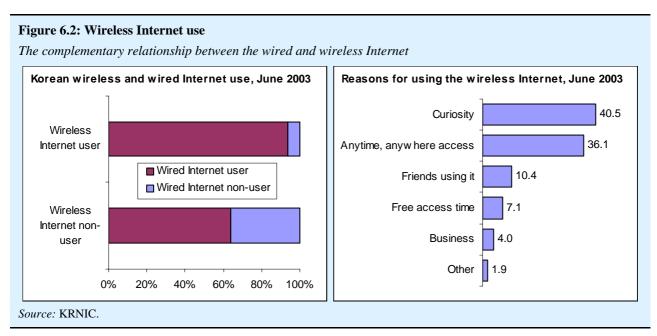
Seoul's *DongDaeMun* market is a good example of how Koreans function at all hours of the day. The market's busiest hours are between 11 PM and 5 AM in the morning. Restaurants are all open, sidewalks packed, and traffic jams common at 3 AM. For shoppers, *DongDaeMun* is a clothing paradise and it reflects the constant, always-on attitude of Koreans³⁴. Much like the *DongDaeMun* market, the mobile information society in Korea is always open, always busy, and there is always something to do.

Figure 6.1: Mobile, PC and Internet usage in Korea Koreans use their mobile phones an average of 4.1 hours per week and use PCs for around 14.6 hours per week Korean voice call usage per week, hours Korean PC/Internet usage per week, hours PC use ΑII ☐ June '03 Female ■ Internet use ■ Sept '02 Female Male Male 12-19 12-19 20's 20's 30's 30's 40's 40's 50's 50+ 60 +0 2 4 6 0 5 10 15 20 25 Source: KRNIC and NIDA.

Korea's apply the same vigour to shopping in the middle of the night at *DongDaeMoon* to the mobile connectivity. Korean's are heavy mobile users with a typical user making 4.1 hours of calls a week, roughly 1'000 minutes a month (see Figure 6.1). In addition, the average mobile user also sends 42 SMS messages a week (6 per day, 168 a month). People in their 20's make the most phone calls while teenagers are the heaviest SMS users, far outpacing any other segment of the market.

Similarly, Korean's use computers, on average, around 14 hours 36 minutes per week, of which 11 hours 30 minutes (almost 80 per cent) is online. Again, it is 20 year olds that are the most intensive users of both PCs and the Internet. Those in the 30-39 year bracket have the greatest offline use of computers while 12-19 year olds seem to be online most of the time that they use the computer.

This high correlation among Korean wired and wireless users highlights the complementary relationship among the two access technologies. Some 93.8 per cent of mobile Internet users also use the wired Internet. However, of those that do not use the wireless Internet, only 63.8 per cent use the wired Internet such as broadband (see Figure 6.2, left). This is an important and key aspect for the Korean mobile information society, highlighting the important role that a converged network will play.



Korean operators have been generally successful at convincing subscribers to try out mobile wireless services (see Figure 6.2, right). When users were asked the reasons they used the mobile Internet, in June

2003, 41 per cent stated it was out of curiosity. Anytime, anywhere access was the second-most stated reason with 36.1 per cent of respondents. One interesting point is that business use was ranked relatively low, with only 4 per cent of respondents stating it was their reason for using the mobile Internet. This seems to show how, in the initial stages at least, the mobile Internet is more about staying connected with friends and family, than more traditional business use. This largely parallels experiences with fixed-line broadband, where residential use, rather than business use, has initially driven the market.

6.1.2 Mobile handsets as the information gateway to the home

Korean mobile operators and handset manufacturers envision a society where mobile phones replace keys, wallets, credit cards, as well as function as the control for all the user's appliances. Many of these services are already available in Korea with several mobile operators offering home networking and application control over their 3G networks. One of the most advanced services is SK Telecom's *Nate* service that can interact and control networked appliances from afar (see Box 6.1)

Mobile handsets play a vital role in this vision of an intelligent home network. This network will enable a household of appliances to be controlled remotely via a mobile phone or over another IP connected device. The Korean Government hopes to have 10 million homes with intelligent networks by the year 2007; roughly 61 per cent of all households in the country³⁵.

MIC has determined that intelligent home networks should play a key role in the Government's overall ICT strategy and will target the industry with US\$ 213 million (249.3 billion Won) of investment from 2004 until 2007. In addition, the Government is assembling a set of initiatives to set the foundation for intelligent networks. These include developing a home network platform that combines communications, broadcast video, and gaming.

In July 2003, the Government started a one-year test project to develop a home network platform based around the Linux operating system. Linux was chosen in order to avoid the expensive licensing fees of proprietary operating systems. ETRI is currently working on developing the platform and testing it for use. The Government's targeted investment in intelligent home networks will also establish an RFID research centre, as well as helping to establish RFID, sensor networks, and the BCN.

Korea's telecommunication manufacturers are also involved in developing intelligent home network systems. Samsung and LG are creating network-ready appliances, along with complementary technologies such as power line communications (PLC) for connecting the appliances to the network, middleware, and microchips.

There is immense interest in being able to control all devices in a home via a mobile phone. However, the vision is not entirely clear on how users will make the best use of this networked environment. RFID chips on food packaging in the refrigerator are commonly used as an example. Users would be able to remotely check which foods they were out of via their mobile phone. Other examples have shown that the air conditioning in an apartment could be turned on and off.

The problem with these examples is that while they are both convenient uses, the benefits may not be able to outweigh some of the privacy issues and costs associated the service. This may delay rollout until a secure network that people trust has evolved; and that may take time.

Box 6.1: Controlling home applications via mobile phone

When Korean mobile phones become a very long-range remote control for household appliances

If Samsung has its way, soon mobile phones will act as a remote control for all household appliances. Koreans will be able to check to see if they left the iron on while at a movie theatre with friends. Samsung has a strong interest in the technology as both a manufacturer of household appliances (e.g. air-conditioners, refrigerators) and telecommunication handsets.

Each home appliance is equipped with a network card that allows it to communicate through the power lines of the home. A server, called a "home gateway" controls all communications with appliances by receiving requests from a mobile phone or the Internet and passing the information to each of the appliances. Users would be able to securely control the devices in their homes via any available Internet connection. This would include mobile phone, PDA, or broadband Internet connection.

In order to test the technology, Samsung built the technology into a new apartment complex (construction is another branch of the Samsung Conglomerate), the Tower Palace. Devices throughout each apartment are controllable via a mobile phone. Residents can control a wide range of appliances, including the air-conditioner, the refrigerator, the washer/dryer, and the electric gas stove.

SK Telecom is currently offering a service to *Nate* subscribers that allows people to leave video messages when they ring a doorbell and the *Nate* subscriber isn't home. If no one answers the door, the doorbell system uses its integrated camera to record a video message that is then delivered over SK Telecom's EV-DO network. The service also allows users to press a button on the remote handset to unlock the door if they choose. This could be particularly handy to let a friend in the door when they don't have a key.

Sources: http://www.sktelecom.com/english/cyberpr/pr-center/exhibitions/ and http://www.samsung.com/HomeNetwork/SAMSUNGhomevita/Achievements/Pilot.htm.

6.1.3 Post PC

Korean's are looking forward to the next generation of mobile computing devices, sometimes called "Post PCs". Two categories of Post PC products are of particular interest to the mobile information society in Korea: portable and wearable. These devices can be a PDA or tablet, or special watches and clothing. What may set these devices apart from PC's and PDAs as we know them is the user input method. The mobile Internet has long been constrained by a good method for inputting information. Users have had to rely on either tapping letters or writing them by hand on PDAs and voice recognition software has not advanced to the point that it can reliably be used to enter information. However, Samsung has been working on a solution to this dilemma and has recently released what it claims to be the world's first wearable mouse.³⁶

6.1.4 Telematics

Korean's are keenly interested in "telematics", which is a terms they use to describe a merger of technologies: the automobile and mobile communications. Telematic services include a mobile communication device (e.g. a PDA or mobile phone) and a GPS to pinpoint location. The result is a system that can receive up-to-date traffic information, transmit information on specific businesses in the car's area, conduct remote diagnosis of car troubles and report accidents.³⁷ The Korean Government has declared that the car will become the "third Internet arena" and will help with the development of terminals, and the establishment of a telematics traffic information centre that will deliver real-time traffic information.

The private sector has also been investing in telematics with several Korean car manufacturers already building the system into their new models. Renault-Samsung has started installing Samsung's SM5 telematic technology in its vehicles. Hyundai Kia's luxury vehicles, the Grandeur XG, EF Sonata, and the Regal are also now sold with telematics systems preinstalled. This year, the manufacturers will include telematics equipment as standard features on mid-range cars as well.

Mobile, and even fixed line operators, are looking for telematics to be a boon for business. The country's three mobile operators, SKT, KTF and LGT have all declared their entry into telematics with fixed-line provider KT also announcing telematic plans (see Box 6.2).

6.1.5 Location-based services

The key component that makes location-based services possible in Korea is the Global Positioning System (GPS). Even now, Korean's have a wide variety of location-based services available to them. Currently, SKT's *Nate* subscribers can subscribe to a system where a user's position is given via GPS on their mobile

phone with maps and information about the area updated over the CDMA network. Users can find directions using voice commands or by moving through a set of menus on the phone.

Box 6.2: Gas with your handset

How LBS services direct Korean drivers to the best petrol bargains

Drivers need not panic when their cars run low on fuel and they are in unfamiliar areas of the city. Instead of pulling over into the nearest petrol station for fuel, LBS subscribers will be able to press a button on their mobile phone and receive a list of prices of gas stations within a 1.5 kilometre radius of their exact position. Once a low price is selected, the mobile phone displays exact driving directions to the nearest filling station, car wash, or parking lot. A car requiring 30 litres of petrol could save up to US\$ 2.50 (3'000 Won) by using the service.

Source: http://www.etnews.co.kr/

The Korean Government has designated LBS as a next-generation strategic export item that will precede CDMA. The Government successfully launched several LBS pilot projects throughout the country in the fields of emergency rescue aid, disaster management, and car navigation systems (see Box 6.3).

The evolution of telematics in Korea promises to make a large difference in the life of Koreans. One area this will be especially noticeable is in traffic in Seoul. It is not uncommon for Koreans to have televisions mounted next to the driver's seat of a car so they have something to watch during traffic jams common throughout the day. However, a well-functioning telematics system could help ease some traffic congestion by delivering precise data to drives that would lead them to less-congested roads.

Box 6.3: How LBS on mobile phones save lives in Korea

Korean fire-fighting and rescue services are making use of LBS to reach people faster in cases of emergency. Certain mobile phones are equipped with an emergency button that can send out a distress call including the location of the person in need of help. Rescue services receive the message and are then guided to the distressed via car navigation systems built-in to emergency vehicles. In addition to simple road navigation, the 3G mobile network updates the navigation with up-to-the-minute traffic conditions in order to plot the most efficient route.

The benefits of the LBS system are obvious. People can get emergency rescue services from fire or crime scenes without elaborating their exact position. This is seen as an especially important project for the aging population in Korea who benefit from the independence they receive from being able to continue living on their own and knowing help is but the push of a button away.

Source: KADO.

6.2 Social drawbacks — the Korean experience

The ubiquitous information society is exciting for Koreans and they have found efficient uses for the technology. However, the benefits are not without costs. As mentioned before, Koreans sometimes have a difficult time separating themselves from work and the mobile technologies have future increased the amount of time Koreans are attached to their jobs. In addition, the vast amount of information available to Koreans has raised some alarms about how to maintain privacy. Finally, the Korean ubiquitous information society may have negative social effects on human interaction.

6.2.1 The meaning of teleworking in Korea

Korea has the most extensive broadband network in the world, along with one of the leading mobile networks. It would therefore seem fitting that Korean would be an optimal testbed for teleworking. However, the idea of working from home has not gained much acceptance in Korean culture. It is vital for workers to be physically present in the office each day, usually in view of, or calling distance from, their boss. Korean workers traditionally stay in the office until the boss has gone home, often very late at night. Instead of using teleworking as a substitute for commuting into work, it has become a complement, allowing them to attend to work even after they've gone home for the day.

Several years ago, employees might stay late at the office but would have time to themselves once they left. Now, they are always in contact via their mobile phones. Surprisingly, Korean firms don't supply mobile phones to their employees but rather expect them to bring, and use, their personal mobile phones to work.

6.2.2 Security in the ubiquitous network society

As Korean mobile devices are becoming commonly used to aggregate a wide range of devices such as keys and wallets, the issue of security in the ubiquitous network society is more important. Losing a mobile phone in the early days of mobile communication usually resulted only in the lost cost of the handset, since the mobile operator could quickly shut off the service. However, with the current mobile phones in Korea, users may be losing a lot more.

Instead of simply losing a terminal, users may lose smart cards with banking information, their credit cards, the keys to their house, and their public transportation pass. Operators have been good at building safeguards into the system that allow Koreans to quickly cancel services but even so, the risks are great for Koreans. In addition, replacing all the services lost in one fell swoop is a long and arduous task. Mobile phones already account for a increasing number of thefts in countries around the world. Even more alarming, many of the victims are youth with mobile phones. In the UK, estimates say two-thirds of the monthly 10,000 mobile phone theft victims are between the ages of 13-16 years old³⁸. In Korea, stolen phones are usually reprogrammed and sold. While having a mobile phone stolen and others calls billed to a user's account may be costly, the potential for harm is much worse as both phones and thieves become more sophisticated.

6.3 Korea's information society

Koreans may be more trusting about how their data is used than users in other developed economies. While there can be no concrete proof of such a broad statement, the rate of adoption of technologies such as m-commerce, m-banking, and m-brokerages imply that Koreans may adopt these services more readily than users in other economies. M-commerce services have been slow to unfold outside of Asia for many reasons, but privacy concerns of users have been tantamount. Many western users will not adopt a technology until their fears have been assuaged.

Koreans, on the other hand, appear to have a stronger sense of community trust in their institutions to protect their data. This has allowed Korea to become a leader in general m-commerce while other economies languish.

While Korean's may be more trusting of their institutions and the safeguards in place, this does not imply that Korean mobile operators, handset manufacturers and commercial establishment do not make security a high priority. Phone manufacturers are starting to implement fingerprint and voice recognition into the mobile phones as a way to make them more secure for users. Biometric technologies increase the cost of a mobile phone significantly but are seen as necessary to prevent abuse of m-commerce.

6.3.1 Privacy

Korea's CDMA networks, by technological design, are fairly secure due to their use of spread spectrum technologies. However, as the networks become more saturated with data and users, the small potential for abuse increases. Korean users will need to be diligent with their handsets and Korean network operators must continually implement cutting-edge security into the networks to protect users' privacy.

Recently Korean equipment manufacturers have been asked to help solve a privacy issue inherent with new mobile phones, unauthorized photographs. Almost all new Korean mobile phones contain small cameras that can be used to take photos where traditional cameras would have been detected and banned. In response, Korean handset manufacturers have included new safety precautions to ensure people know when a picture is being taken (see Box 6.4).

Box 6.4: Stopping a peep with a beep.

How Korean mobile phone manufacturers have added "clicking" sounds to mobile camera phones to help solve the problem of unauthorized photography

Korean's love the hot sauna baths (*mok yok tang*) around the country. Men and women always bathe and soak separately in a peaceful Korean ritual of moving between saunas, hot, medium, and cold pools. However, the serenity of the "*mok yok*" experience has been shattered by mobile phone users surreptitiously sneaking in their phones and taking pictures of unsuspecting bathers in the nude. In a recent case, a woman used her camera phone to snap pictures of naked women in the *mok yok tang* and then sold them to a popular website.

In response to public outcry, the MIC has required mobile handset manufacturers to equip new mobile camera phones with a non-mutable click that sounds every time a picture is taken. The new phones make a sound of at least 65 decibels when a picture is taken. An estimated 4 million camera-equipped mobile phones were sold in the country in 2003.

Source: "Korea: Beeping Prevents Peeping" at: http://www.wired.com/news/technology/0,1282,61197,00.html.

6.3.2 Cultural changes

In some instances, mobile technologies have been used to strengthen already existing norms in Korea. This includes workers using mobile phones to work longer hours and to stay more connected than before. However, in other areas, mobile phones have completely changed elements of Korean culture. An example is the traditionally silent, tranquil subway has become vibrant and loud with people talking on mobile phones and playing mobile games.

One of the most striking cultural elements of Korea's mobile information society is how people are willing to share their mobile phones with others to make telephone calls. In most countries of the world, mobile calling is restricted to necessary communication because per-minute tariffs are so expensive. Users will often choose to send a cheaper SMS messages than make a voice call on a mobile network. Even friends hesitate to ask friends if they can borrow a mobile phone to make a call.

In Korea, MIC has kept the cost of voice communication low by negotiating a local tariff ceiling of US\$ 0.07 a minute (80 Won). This low price, plus Korean's Confucian traditions have created an environment where people are willing to let friends, relatives, and even perfect strangers on the street borrow their phones to make a quick call.

Avatars

Korean culture has also changed drastically with the growing popularity of avatars. Avatars are cartoon representations of people that are used in virtual chat worlds and on mobile phones as screen savers. Different from traditional chat programs where users employ only a small picture or cartoon to represent themselves, avatar users communicate in virtual worlds. One of the most popular avatar sites is Neowiz's "SayClub" that has over 20 million subscribers, equivalent to nearly half the population of Korea.

What makes the avatar phenomenon so interesting is how much users are willing to pay to outfit their avatar with clothing and accessories. When a user signs up to a virtual world, their avatar comes only with underwear. Each additional item of clothing or accessory much be purchased and applied to the avatar. Users can buy designer avatar clothing, with licensing fees being paid to actual trademark owners such as Gucci. This has led to situations where Korean avatar owners spend more money on clothing for their avatar than they do for themselves. Daewoo Securities has estimated that the avatar market in Korea to be worth US\$ 114 million in 2004, up from US\$ 64 million the year before.³⁹

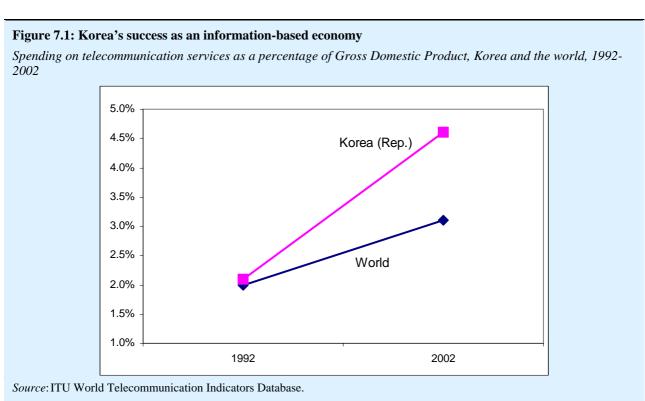
The avatar phenomenon, in some ways, seems to be a logical extension of Korea's history with group dating for young singles as a way to meet other people. By using avatars in virtual worlds, users often feel freer to open up, talk, and interact with each other. Indeed, often these avatar relationships can blossom into real-world relationships for users. However, some have questioned whether the avatar phenomenon is going to be a net positive for Korea. Some believe that avatar worlds are simply expensive "fantasy lands" that push users further into isolative behaviour.

7 Conclusions

Electronic information, available from anywhere, at anytime and from any device, has become a staple of Korean life and studying the Korean model can give insights to how mobile information services will evolve in other countries around the world. There are several elements of the Korean experience that can be replicated and other elements that are specific to Korea. This section looks at certain key lessons policy-makers can draw from the Korean experience.

As has been discussed in this paper, much of Korea's success as a ubiquitous network society can be attributed to keen investments in ICT education by the Government. Money collected from mobile spectrum allocations were strategically reinvested in ICT promotion rather than being simply put into the government's general fund. This has helped Korea catapult to a world leader in ICT by creating a vast, ICT-savvy consumer base that has fueled Korea's tremendous growth. Other economies would be wise to consider following the Korean model of strategic re-investment of telecommunication funds.

One illustration of Korea's success over the last decade or so is the extent to which it has increased the level of spending on telecommunications as a percentage of GDP, where it has grown to be almost twice the global average by 2002 (see Figure 7.1). Given the fierce competition in the services market, it is unlikely that this results from higher prices. Rather, it is a reflection of the increased choice that Korean consumers enjoy, with high-speed Internet services, both on fixed-line and mobile platforms, having been rolled out in Korea well ahead of other countries.



Korea also offers the world an excellent example of telecommunication competition. Korea's world-leading broadband position is strongly tied to the level of competition between broadband providers. The mobile market is also strongly competitive with three highly developed networks. Policy-makers in other economies might usefully examine what elements of Korean government policy have contributed to Korea's vibrant market competition.

As the world looks forward to an increasingly converged network environment, Korea's broadband converged network may represent a model for similar networks around the world. While other economies may not be as far towards true convergence as Korea, policy-makers in all countries should look at the policies Korea is currently developing. These include key policies such as creating mobile exchanges, implementing technologies like IPv6 and ENUM, and looking forward to how operators of the future will need to be regulated (e.g. ownership restrictions for different types of networks). Korea's initial experiences with these policies will foreshadow future decisions for regulators and policy-makers around the world.

Another area that may bring unexpected dividends to other economies is in the field of mobile Internet technologies. One of the most important policy decisions for the Korean mobile information society involves the development of the "Portable Internet". The Portable Internet would work on mobile phones and allow users to browse the Internet, stream audio and video, and have video conversations.

While the Portable Internet will play a key role in the Korean ubiquitous network society, developing economies could reap its largest benefits. The Portable Internet could bring Internet connectivity to the developing world the same way mobile phones have brought voice. Policy-makers around the world, especially in developing economies, could usefully examine the evolution of the Portable Internet in Korea as a way to spread broadband data to the world's mobile phone users.

Even where the negative aspects of the proliferation of mobile and Internet technologies are concerned, Korea has some interesting lessons to pass on. Policy-makers in Korea have already been addressing issues such as Internet addiction and mobile SPAM that have only just started to appear in other countries around the world. Advanced mobile markets such as Korea and Japan are forced to make groundbreaking policy and social decisions without any other country examples to follow. What is clear is that many of the problems showing up in leading mobile information societies now will begin to appear in other economies around the world. This allows policy-makers around the world a glimpse of what is to come, allowing them better time to plan and prepare.

One area where this will be especially important is privacy and data protection. As the mobile phone becomes the payment method of choice in Korea, consumers will demand better and more secure protection of their data. Korea's mobile leading work with mobile payment systems can offer a foundation for other mobile operators and banks that are moving into m-commerce. At the least, Korea's early lead with mobile applications such as banking and m-wallets can provide researchers with excellent case studies for new service implementations in their own economies.

Korea is on the cutting edge of the ubiquitous network society and nations around the world are watching as Korea's highly-developed Internet and mobile networks move towards convergence. As the network evolves, so do its users. Koreans have quickly adopted and integrated mobile and Internet technologies into their lifestyle. In fact, life in Korea has become a life surrounded by information. Users of all ages are taking advantage of quick, easy access to information and using technology to increase their productivity.

At the same time, Korean's are faced with both positive and negative elements of the mobile information society. While the Korean information society is moving into uncharted area, the main players involved are taking great care to help protect information and make the information society a safe place. No one knows exactly what the future ubiquitous network society will look like, but Koreans are on the verge of making it a reality.

The term "ubiquitous dreamworld" comes from a special permanent exhibition on ubiquitous network societies staged at the premises of the Korean Ministry of Information and Communication, in Seoul, see: Hhttp://www.ubiquitousdream.or.kr/H.

- ² ITU World Telecommunication Indicators Database.
- 3 See ITU Korean IT Case Study at: Hhttp://www.itu.int/ITU-D/ict/cs/korea/material/CS KOR.pdfH.
- ⁴ See the ETCA news release on the "Local Loop Unbundling scorecard" at: Hhttps://www.ectaportal.com/html/index.php?pgd=regulatory_article&sc=3&rec=1839H. .
- See "South Korea: Living Laboratory for Broadband" at: Hhttp://www.broadbandhomecentral.com/report/backissues/Report0301 4.htmlH.
- See "Invaders from the land of broadband", Dec 11, 2003, Hhttp://www.economist.com/business/displayStory.cfm?story_id=2287063H.
- ⁷ See "Online Game Special", in IT Korea, March 2004 issue, pp 51-69.
- ⁸ IT Korea, November 2003 (Issue 4), International Cooperation Agency for Korea IT.
- 9 See World Markets Telecoms Daily, "South Korea: SK, KTF Reveal Contrasting Fortunes in Q4 2003 "February 2, 2004.
- ¹⁰ IT Korea, November 2003 (Issue 4), page 100, International Cooperation Agency for Korea IT.
- 11 See "Korea eases 3G auction rules" at: Hhttp://www.3gnewsroom.com/3g news/jan 01/news 0209.shtmlH.
- Future services are expected to allow for 100 Mbit/s in high-speed vehicles while providing up to 1Gbit/s at walking speed by 2010.
- 13 ITU-R defines IMT-2000 enhancement as a multimedia service delivering 10 Mbit/s under fast moving conditions.
- High Speed Wireless LAN will provide multimedia information at 500 Mbit/s 1 Gbit/s for laptop computers or PDAs with 100m radius.
- ¹⁵ See MIC Internal Report, "Wireless Mobile Telecommunications Industry Promotion Plan," September 2003.
- For a primer on WiBro, see the presentation from Samsung at: Hhttp://www.itu.int/ITU-D/imt-2000/documents/Busan/Session3_Yoon.pdfH. For more background on the general concept of "portable Internet technologies", see "ITU Internet Reports 2004: The Portable Internet", 220pp, Geneva, available at Hwww.itu.int/portableinternetH.
- ¹⁷ See: *Three Operators picked for home grown Portable Internet service*, at: Hhttp://www.mic.go.kr/index.jspH, on 10 March 2005.
- ¹⁸ HIbidH, on 16 February 2005.
- ¹⁹ PCS represents CDMA service in the 1.8 GHz frequency band.
- ²⁰ Welcome to e-Korea, Korea Agency for Digital Opportunity and Promotion, page 38.
- See "Mobile banking transactions doubled in 2003" at: Hhttp://www.koreaherald.co.kr/SITE/data/html_dir/2004/01/28/200401280037.aspH.
- ²² See "Samsung's Golden Touch" at Hhttp://www.samsung.com/mea/english/news-040102a.htmH.
- ²³ Shin Sang-Chul, "IT Infrastructure for Tomorrow with Korean Experience", October 2003, IST 2003.
- ²⁴ ITU/MIC Korea Symposium "Towards the realisation of the broadband convergence network", held on 3 March 2004, Seoul. For more information, see: Hhttp://www.ica.or.kr/en/itu-en/ITU_6.aspH.
- ²⁵ See "Wiring Korea Competition heats up for 2.3 GHz mobile Internet" at: Hhttp://times.hankooki.com/lpage/tech/200306/kt2003060818544410840.htmH.
- ²⁶ See "Hanaro Pulls Out of WiBro", in *Red Herring*, 26 April 2005, see: Hhttp://www.redherring.com/article.aspx?a=11890H.
- ²⁷ See Korea Times Article at: Hhttp://times.hankooki.com/lpage/tech/200406/kt2004061618183911800.htmH.

- See "EU teams with Korea on IPv6 development" at: Hhttp://news.zdnet.co.uk/communications/networks/0,39020345,39119162,00.htmH.
- For more information, see Sewon Oh, "RFID/USN technology in Korea", presentation made at ITU's "New Initiatives Workshop on Ubiquitous Network Societies", 6-8 April 2005, Geneva, at: Hhttp://www.itu.int/osg/spu/ni/ubiquitous/Presentations/2_oh_RFID.pdfH.
- 33 See: Hhttp://pulverblog.pulver.com/archives/001221.htmlH, citing an article in The Korea Herald, October 2004.
- The DongDaeMun market even has its own website: Hwww.dongdaemun.comH.
- ³⁵ See IT Korea, January 2004 (Issue 5) at: Hhttp://www.ica.or.kr/en/journal_read.asp?board_seq=250&seq=948&page=1H.
- ³⁶ See: The Korea Times: Samsung Develops World's First Wearable 'Mouse' at: Hhttp://times.hankooki.com/lpage/biz/200312/kt2003122417420911910.htmH
- See IT Korea, January 2004 (Issue 5), page 35 at: Hhttp://www.ica.or.kr/en/journal_read.asp?board_seq=250&seq=948&page=1H.
- ³⁸ See "Safeguarding your mobile phone" from the Metropolitan Police at: Hhttp://www.met.police.uk/crimeprevention/phone.htmH.
- ³⁹ See "Is Another Bubble About to Pop in Korea?" at: Hhttp://www.businessweek.com/magazine/content/03 39/b3851157 mz033.htmH.

²⁸ DMB is the version of mobile broadcasting favoured by MIC. However, industry players may have their own names for competing, but similar technologies. These include PSMB, and BCMCS.

²⁹ For a description of the IT 839 strategy, see: Hhttp://www.mic.go.kr/eng/res/res_pub_it839.jspH.

Mobile networks have traditionally been closed from public traffic, unlike the public Internet, because of differences in its inherent cost structure. Internet backbone networks can handle data at very low cost. In contrast, the bandwidth allotted to mobile carriers is much more scarce and is thus also more expensive. However, as networks converge, the two networks need to be able to freely pass information back and forth, regardless of differences in cost.