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**SHAPING THE FUTURE MOBILE INFORMATION  
SOCIETY:**

**THE CASE OF THE REPUBLIC OF KOREA**

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February 2004

This case study has been prepared by Taylor Reynolds ([taylor.reynolds@itu.int](mailto:taylor.reynolds@itu.int)) and Jeong Jin-Kyu ([jinkyu.jeong@itu.int](mailto:jinkyu.jeong@itu.int)), Strategy and Policy Unit, International Telecommunication Union (ITU). The Korean case study is part of a series of telecommunication case studies produced under the New Initiatives programme of the Office of the Secretary General of the ITU. The mobile information society case studies programme is managed by Lara Srivastava ([lara.Srivastava@itu.int](mailto:lara.Srivastava@itu.int)), under the direction of Tim Kelly ([tim.kelly@itu.int](mailto:tim.kelly@itu.int)). The series is edited by Joanna Goodrick ([joanna.goodrick@itu.int](mailto:joanna.goodrick@itu.int)). Other country case studies in this series include Japan, Morocco, and Norway. All materials relating to this case study and the workshop in general can be found at <http://www.itu.int/futuremobile>.

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The opinions expressed in this study are those of the author and do not necessarily reflect the views of the International Telecommunication Union, its membership, or the Korean Government.

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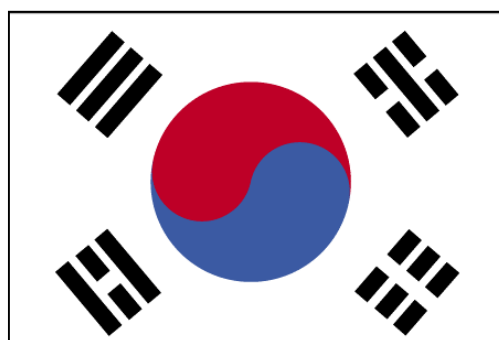
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# 1 Introduction

As the twenty-first century gets under way, the Republic of Korea has found itself at the cutting edge of the information society. With the world watching, Koreans are taking uncharted steps into a life surrounded by information. For many, life in Korea has begun to 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, being Korean means being connected.

However, this is just the beginning. Korea's vision of a converged network, a network that merges broadband, telephony (mobile and fixed), and television is set to continue to change the way that Koreans access and use information from anywhere. This new "unified" network promises to change Korea's mobile 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 technology is nothing 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; 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.



## 1.1 About the report

This analysis forms part of the background research for a New Initiatives Workshop held in Seoul, Korea in March 2004. The Korean case study is just one of four case studies that will explore the implications of a future mobile information society. The other three case studies will cover Japan, Morocco, and Norway. 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.

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 38<sup>th</sup> 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).

Figure 1.1: Korea at a glance



| Republic of Korea          |                                      |
|----------------------------|--------------------------------------|
| <b>Geography</b>           |                                      |
| Coordinates                | 37 00 N, 127 30 E                    |
| Area                       | 98'480 sq km                         |
| Density (inhab per km2)    | 490                                  |
| Terrain                    | Hills, mountains, wide costal plains |
| <b>Population</b>          |                                      |
| Total                      | 48'289'037                           |
| Growth rate                | 0.66%                                |
| Life expectancy            |                                      |
| Women                      | 79.3                                 |
| Men                        | 71.7                                 |
| Median age                 | 33.2                                 |
| <b>Economy (GDP, 2002)</b> |                                      |
| Total (PPP)                | US\$ 941.5 billion                   |
| Per capita (PPP)           | US\$ 19'600                          |
| Growth rate                | 6.3%                                 |
| <b>Language</b>            |                                      |
| Official                   | Korean                               |
| Studied widely             | English                              |

Source: CIA Factbook, 2003.

### 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 12<sup>th</sup> largest in the world, despite being only the 26<sup>th</sup> 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 the 12<sup>th</sup> largest in the world in 2002 with a per capita income of US\$ 9'930<sup>1</sup>, pushing Korea into the World Bank classification of 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 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 until 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 a high level of universal service. Korea signed the World Trade Organization (WTO) Agreement on Basic Telecommunication Services that became effective in November 1997, committing the country to liberalization of its telecommunication sector.

The nation's historical operator is Korea Telecom Corporation (KT). It began as the government-owned Korea Telecom Authority in January 1982. 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 when the Government fully divested itself of the company.

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 1.1).

**Box 1.1: 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 increasing the coffers of governments. However, these funds are often put into the Government's general budget and used to fund non-telecommunication related projects. The Korean Government recognized early that these funds could be strategically reinvested in the telecommunications sector as a way to help Korea become a world leader in ICT. The fees from spectrum licences were pooled together into a government fund called the "Information Promotion Fund".

In addition to the 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 in the fund.

The fund, in total, holds around US\$ 5 billion and disperses around US\$ 500 million on projects to help encourage access to information each year. 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 its ranking as the world's broadband leader. The Korean example shows how careful use of spectrum fees can help boost overall connectivity in the society.

*Source: NCA.*

*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 and Europe), 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 expensive 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 used by other leading broadband economies such as Canada.

### *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 subsequently have become more savvy technology users and buyers (see Box 1.2).

**Box 1.2 : Educating out of the Asian financial crisis**

*How widespread ICT education has helped fuel Korea's growth*

The Asian financial crisis 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 Asian Crisis in Korea was also a turning point for the information society in the country.

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 one fourth 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. 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 (2002) |            | Republic of Korea (2002) |            |
|--------------------------|------------|--------------------------|------------|
| Internet                 |            | Mobile Telephones        |            |
| Users                    | 26'270'000 | Penetration rate         | 67.95      |
| Users per 100            | 55.19      | Total                    | 32'342'000 |
| Intl. bandwidth (Mbps)   | 17'207     | Growth Rate              | 11.35      |
| PCs                      | 26'458'000 | Fixed Lines              |            |
| Broadband                |            | Penetration rate         | 48.86      |
| Total subscribers        | 10'405'486 | Total                    | 23'257'000 |
| Subs per 100 inhab       | 21.5       | Growth rate              | 2.34       |

*Source:* ITU World Telecommunication Indicators Database.

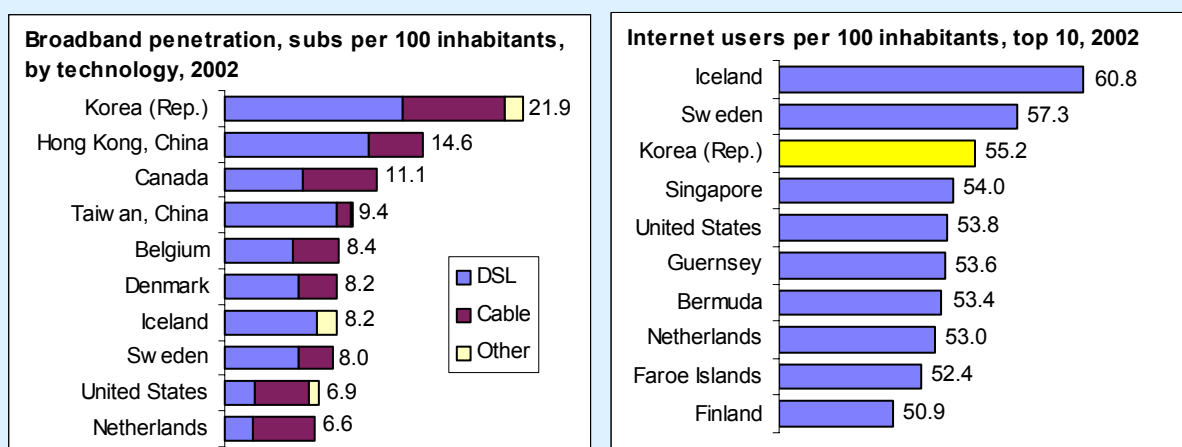
## 2 Broadband

### 2.1 Level of network deployment

Korea is the world's broadband leader by a large margin. In 2002, Korea had 21.9 broadband subscribers per 100 inhabitants (see Figure 2.1). This equates to roughly 60-70 of households subscribed to broadband.<sup>2</sup> In addition to the world's highest broadband penetration rate, Koreans have some of the fastest residential connections in the world at the lowest prices. VDSL broadband connections at 20-40 Mbit/s cost consumers roughly US\$ 50 a month. This extraordinary position is the result of several key factors, especially the level of competition, government involvement, and geography.

**Figure 2.1: Korea as a world Internet leader**

*Korea leads the world in broadband subscribers per 100 and is third in the number of Internet users per 100*



Source: ITU World Telecommunication Indicators Database.

Broadband Internet connections were first available in Korea in July 1998 through the cable provider Thrunet. One year later in April 1999, Hanaro entered the broadband market by offering the world's first ADSL service. Hanaro had been a competitive fixed line 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 unwillingness to deploy ADSL due to their high investment in IDSN. KT quickly responded and began offering its own ADSL service in June 1999.<sup>3</sup>

In 2004, 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 57 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 — which have extensive coverage.

Currently VDSL speeds of 20-40 Mbit/s are available to many Koreans at around 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.

*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 easily be replicated by policy-makers in other economies. Each of the key factors, competition, government involvement, and geography are discussed below.

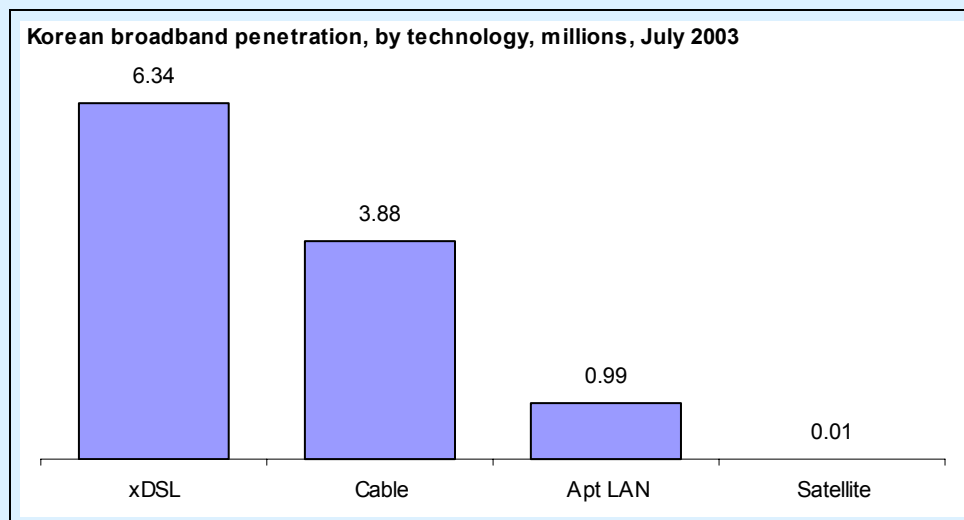
## Competition

Korea's competitive situation will play a major role in helping the Government reach its ambitious goals for universal, high-speed broadband access. As at the beginning of 2004, the broadband competition situation in Korea was close to ideal. 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, accounting for 56 per cent of broadband subscriptions. Cable connections make up 35 per cent of connections, while apartment LAN and wireless technologies cover 9 per cent of subscribed homes (see Figure 2.2). As is common in many economies, cable modem broadband was the first to be offered in Korea with ADSL starting later, but overtaking cable 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.

**Figure 2.2: Korea's broadband subscriptions, by technology**

*Koreans have a solid choice of technologies to choose from when subscribing to broadband*

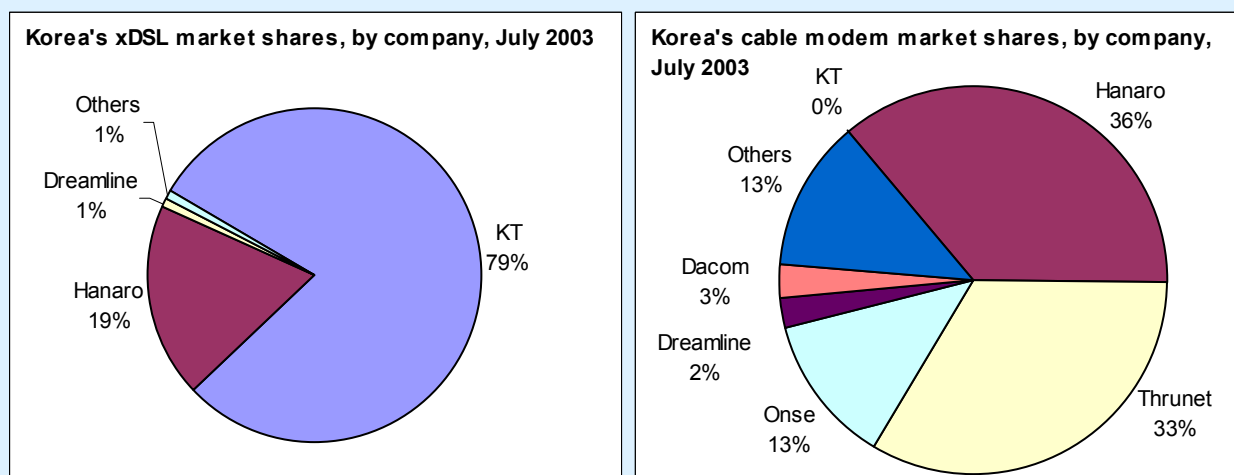


Source: International Cooperation Agency for Korea IT.

Inter-modal competition in Korea is different than in 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 4 different technologies: xDSL, apartment LAN, wireless LAN and satellite.

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

*Breakdown*



Source: International Cooperation Agency for Korea IT.

The number of technology options available from one provider (e.g. Hanaro) would usually cause concern in other economies since broadband rollout is usually very late in economies where telecommunication operators own cable companies. However, the Korean example is a bit 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 will be 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. The hourly charge is US\$ 2.80 (3'300 Won) while the daily charge US\$ 11 (13'200 Won) a day.

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 cut ties with ISDN. However, as soon as KT realized ISDN was a losing investment, it quickly gained back market share and has now overtaken Hanaro's xDSL in terms of DSL subscribers. Currently, KT's 79 per cent share of the ADSL market is clearly dominant 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 supplied nearly 90 per cent of all DSL connections in 2002.<sup>4</sup> In addition, the remaining DSL lines were almost exclusively supplied either by wholesale or through local loop unbundling. The Korean experience is different.

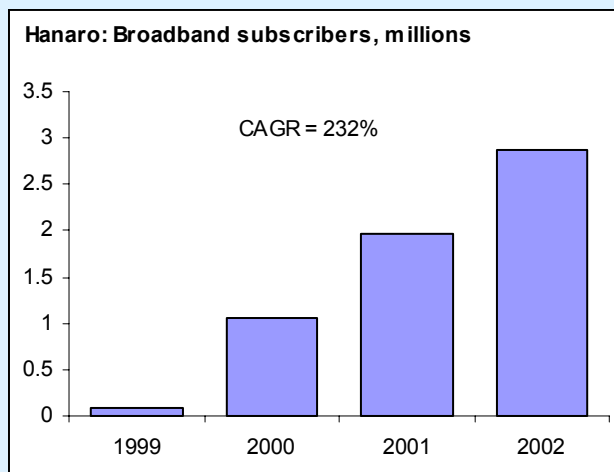
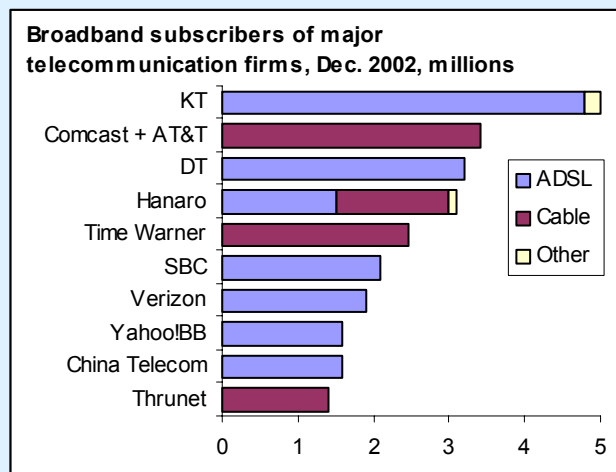
KT still has a large portion of the DSL market, with a 79 per cent market share but Hanaro also has a strong showing in DSL, in addition to having the largest market share for cable modem connections.

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).

This true, facilities-based competition has had an astounding effect on the market. It has effectively lowered prices below and raised speeds above 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 2.4).

The future of competition in Korea looks bright for broadband users. Despite past financial struggles at Hanaro, the future looks better given the recent US\$ 479 million investment by AIG investment<sup>5</sup> and the company’s posting of an operating profit for fiscal year 2002.<sup>6</sup>



Source: Hanaro.

*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.

The first broadband in Korea was provided over a cable network in 1998 by Thrunet. While KT dominates in xDSL, Hanaro and Thrunet are the dominant forces in cable modem access. Cable modem speeds currently provide about 5 Mbit/s and subscriptions are generally around US\$ 24 (28'000 Won) per month.

Korea has more broadband subscribers using xDSL than any other type of access technology. KT has the largest market share at 79 per cent of DSL subscriptions and is considered the dominant player in the market. However, Korea's second largest DSL provider, Hanaro, is not far behind with 19 per cent of the DSL market and 36 per cent of the cable modem market.

### *Geography*

A thriving competitive market and keen government participation have helped propel Korea to the world leading position in broadband. However, Korea's geography has 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 telephone exchange.<sup>7</sup>

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 users 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, some broadband's success is also tied to 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 as 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. These high numbers would translate into very expensive phone charges if connected to the Internet via regular dial-up or ISDN.

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.

**Figure 2.4: Online banking and e-commerce in Korea**

The number of online banking users grew 150 fold between 1999 and 2002. The 2002 Figure represents roughly one-third of the entire population as online banking users. The value of e-commerce transactions grew three-fold between 2000 and 2002, with a 2002 value of roughly US\$ 150 billion



Source: NCA.

### Gaming

In Korea, online gaming is centred around the “PC Bang” or PC Room. PC Bangs are cybercafés that dot the country and offer broadband access and gaming for around US\$ 0.83 (1,000 Won) 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 is surprising given Korea’s high broadband penetration rates. However, often parents 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 one 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 (MUG). Instead of games being considered antisocial, MUGs 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)<sup>8</sup>. The broadband gaming world in Korea is 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.

### 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 provide movies on demand to users in DVD quality (see Box 2.3). 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.

**Box 2.3 : Korea's leading portal's entry into video on demand.**



Source: Daum Communications Corporation.

Korea's leading Internet portal, Daum, launched a video-on-demand service in 2003 that allows users to pay US\$ 1.70 (2'000 Won) per movie they stream. Movies can be viewed at various streaming rates ranging from 300 kbit/s to 1 Mbit/sec.

The video-on-demand section has been so popular that DAUM recently launched CUVE, a service that lets users pay a flat rate of US\$ 8.50 to US\$ 12.00 (10'000 to 14'000 Won) per month for unlimited watching.

Daum offers users many different ways to pay for the service. First, they can pay via an SMS m-payment on their mobile phone. Second, they can pay using Advanced Record Service (ARS) where users are billed to their telephone. Credit cards are also accepted. Daum also accepts money wired from a bank. Finally, users can use DAUM cash earned on the site.

Daum's video-on-demand push is significant because of Daum's extremely high number of users and traffic. Daum's portal had 20.3 billion page views in December 2003 and 22.1 million active user accounts by the end of 2003. The number of active Daum users is striking given the total Korean population of 48 million.

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 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 US\$ 0.85-1.70 (1'000-2'000 Won) 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.

*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.

*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 2.4).



**Box 2.4: 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 fill up their own gas tank at the petrol station and receive gifts (including extended auto insurance coverage for a week after gas purchase) just for choosing one filling station over another. Broadband providers, like gas 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, and ebooks), 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 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.

#### *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. Many economies have indeed talked about universal access for broadband but Korea is one of the first to implement it and definitely the closest to bringing it to fruition.

### 2.4 Conclusion

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. 70 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.

### 3 The mobile framework

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 lost their web browser, game console, electronic wallet, 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.

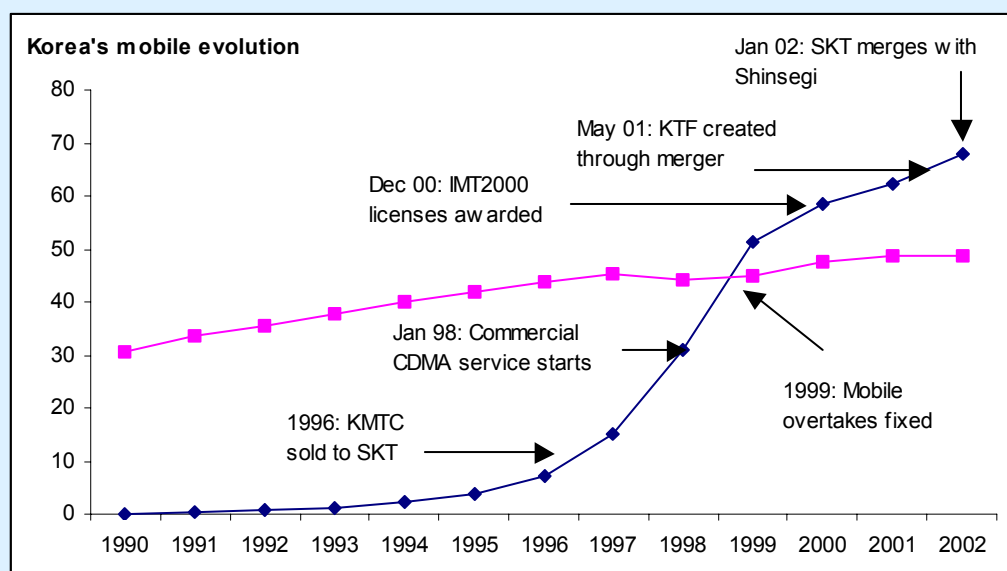
The Koreans mobile market is fascinating because Korea is a world mobile leader on many fronts. First, Korean mobile operators were among the first operators in the world to offer 3G services. Korea has also been the world-leading mobile market offering CDMA services. In addition, Korean handset manufacturers 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 mobile information 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 2002 was 67.9, compared with a fixed penetration rate of 48.9 subscribers per 100 inhabitants. Highlights of Korea's mobile growth are given in Figure 3.1.

Figure 3.1: Korea's rapid mobile growth



Source: ITU World Telecommunication Indicators Database.

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. Korea Telecom Freetel (Now KTF); LG Telecom and Hansol (later M.Com). and the launch of CDMA2000 1x in October 2000 (although commercial services only arrived a few months later).
- **2001-2003.** The period coving the last few years corresponds with somewhat slower growth in the number of mobile voice subscribers, as the market approaches saturation. 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 a launch at the end of 2003. 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.
- **2004 and beyond.** Korean network operators are in a transitional period with the future of the Korea's mobile networks hanging in the balance. WCDMA services are available in some areas and operators are planning on a new mobile, data network in the 2.3 GHz range, which will be discussed in detail in section 4.

#### *Mobile overtakes fixed*

Mobile subscribers in Korea first outnumbered fixed line subscribers in 1999, a year in which only 15 economies worldwide had achieved the feat (see Table 3.1). The economies in Table 3.1 fall into two general levels of fixed-line development in 1999. Economies such as Korea, Austria, Finland, Israel, Italy and Portugal all had relatively high penetration rates for fixed-line telephony (e.g. Finland at 55 per cent and Korea at 45 per cent). The remaining nine economies were struggling with fixed-line connectivity.

**Table 3.1: Mobile overtakes fixed**

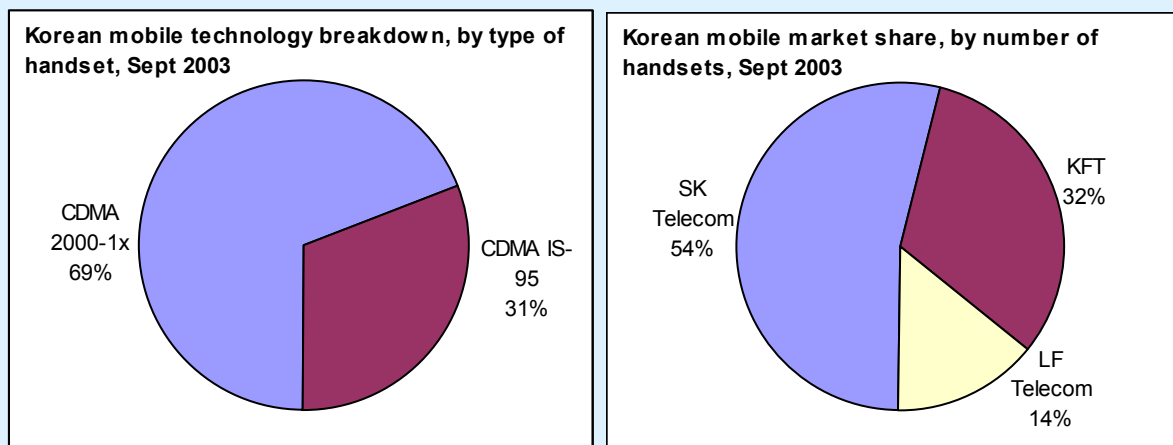
| <i>Economies with more mobile than fixed lines in 1999</i> |                         |                          |
|--|-------------------------|--------------------------|
| <i>Austria</i>   | <i>Finland</i>          | <i>Republic of Korea</i> |
| <i>Cambodia</i>  | <i>Guinea</i>           | <i>Lebanon</i>           |
| <i>Côte d'Ivoire</i>                                       | <i>Hong Kong, China</i> | <i>Paraguay</i>          |
| <i>Democratic Republic of Congo</i>                        | <i>Israel</i>           | <i>Portugal</i>          |
| <i>El Salvador</i>   | <i>Italy</i>            | <i>Venezuela</i>         |

Source: ITU World Telecommunication Indicators Database.

The economies in Table 3.1 with high mobile and fixed telephone penetration represent countries on the leading edge of mobile telephony in 1999. By 2002, 119 economies in the world had more mobile than fixed lines, a feat the 15 economies had achieved 3 years earlier.

**Figure 3.2: Breakdown of the Korean mobile market**

Nearly 70 per cent of Korean handsets use CDMA2000 1x technology with SK Telecom dominating the market



Source: International Cooperation Agency for Korea IT.

### SKT

SK Telecom (SKT) is the largest mobile operator in Korea, with a market share of 54.3 per cent as of September 2003<sup>9</sup> 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.<sup>10</sup> 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).

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 August 2003, it had 16.4 million mobile Internet handsets with 13.2 million of those subscribing to *Nate*.<sup>11</sup>

In addition to its CDMA2000 licence in the 800 MHz range, SKT has a WCDMA licence in the 2 GHz band and is set to launch limited service in early 2004.

### KTF

KTF is the second largest mobile network operator in Korea and has 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 WCDMA 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 and EV-DO. KTF is planning on rolling out EV-DV services by the end of 2004.

KTF stands out from the other mobile carriers in the sheer number of different plans users can select from. They claim to be the first operator in the country to introduce segmented marketing (see Box 3.1).

### Box 3.1 : Marketing mobile to different age groups and demographics

*KTF's strategy to sell mobile telephony within defined demographics*

KTF has chosen to market its services based on specific consumer groups. By targeting different demographic groups, KTF has been able to offer special features that users commonly use with people falling into their same demographic. Examples include free SMS between Bigi Kiri users. KTF breaks down users into the following groups:



**Bigi:** 13-18 year olds. Flat rate pricing and free SMS among other Bigi Kiri users.

**Na:** 18-25 year olds. Free movie theatre passes. Internet connection service at 68 universities. Handset recharging services around the country.

**Main:** 25-35 year olds. Various call plans based on the amount of calling time per month. Similar to traditional plans.

**Drama:** Women. Book café, make-up zone, 'Drama house' cultural area and 'Drama kids' for childrearing advice.



In addition, KTF offers other services such as 'Magic(n)' that allows downloading of applications to run on the BREW platform, 'K-merce' that enables e-transactions such as m-banking, 'Fimm' for streaming audio and video and video-phone services, and 'Viz' their business solution.

Source: <http://www.ktf.co.kr>

### 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 and LG Telecom belongs the same way 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 5<sup>th</sup> leading manufacturer of mobile handsets.

While SKT and KTF both successfully bid for WCDMA licences, LG Telecom instead was awarded another CDMA2000 licence in the 1 GHz range.

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 3.2). 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.

**Table 3.2: CDMA development in Korea**

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

Korea's original CDMA licences were awarded by a beauty contest with SKT receiving a licence in the 800 MHz range and LGT and KFT receiving higher 1'800 MHz frequencies. Korea held auctions for two WCDMA licences in 2000 with all three mobile providers bidding for the two available licences. At the same time, the ministry accepted bids for more CDMA2000 licences, with only Hanaro Telecom bidding.

The ministry accepted the bids of SKT and KTF for WCDMA 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 areas<sup>12</sup>. With LG Telecom's unsuccessful bid for a WCDMA 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 WCDMA.

### **Box 3.2: 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 1988 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 1940's as a military technology to mask conversations. The technology was important to militaries 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 struck 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 dual auctioning of WCDMA and CDMA2000 licences highlights a key dilemma faced by Korean policy-makers. Both technologies are seen as vital to different segments of the Korean market. On one hand, 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. Korean companies such as Samsung are also heavily invested in building WCDMA cell towers which will be sold around the world.

On the other hand, Korea is the world leader in CDMA2000 and has achieved much of its tremendous success due to the technology. The existing networks have been easy to upgrade, helping Korea reach faster mobile speeds more quickly than the rest of the world. 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 3.2).

These two, often contradicting, policy objectives pose problems to Korean mobile promoters. Rather than choosing one technology, the Government has instead decided to attempt to have two co-existing networks running two types of technologies. The risk if this policy is that in the effort to standardize with the rest of the world, Korea may be subjecting itself to the problems plaguing other countries with WCDMA networks that have been unable to install and run 3G networks profitably.

#### *IMT-2000*

Currently, there are two main IMT-2000 technologies in Korea, CDMA2000 and WCDMA. Both offer relatively high-speed data transfer for small amounts of data at reasonable cost. Currently CDMA2000-1X EV-DV offers maximum peak speeds of 5.2 Mbit/s while proposed WCDMA HSDPA networks could theoretically deliver between 8-10 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 CDMA2000 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 WCDMA 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 WCDMA licences, but have since perhaps been hesitating to build out extensive networks given the huge expensive in building new networks 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. The portable Internet will be explained in 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 WCDMA 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 WCDMA networks (see Box 3.3).

### Box 3.3 : Dual-band, dual-mode handsets

LG's new phones allow users to connect to both CDMA and WCDMA networks<sup>13</sup>



Korea's mobile networks are very well entwined with CDMA technologies. However, it has caused problems for roaming abroad, or for visitors coming from a predominantly GSM world. However, LG's new dual-band, dual-mode mobile phone could change that. It works on the CDMA networks in Korea and WCDMA networks beginning to surface in Korea.

There has been some reluctance among Koreans to switch over to WCDMA services because of their limited coverage area. This is in sharp contrast to near complete coverage of by CDMA networks. However, the new DBDM phones should help change that. Users will be able to use WCDMA networks when in range and change back to CDMA2000-1x in others. LG's new phone (Model: LG-K8100) comes with a 2.2-inch and 260,000 color TFT-LCD screen. As is common in Korea, the phone also includes a high-resolution camera that can be used for video chat.

Currently, the phones require two different chips, one for each network. However, LG Electronics is working on developing a one-chip solution for DBDM phones of the future.

Source: LG, <http://www.eteckorea.info/articles/20030214002.php>.

### 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"<sup>14</sup>. These new networks have been defined to include New Mobile Access, IMT-2000, IMT-2000 enhancement<sup>15</sup> and high speed wireless LAN<sup>16</sup>, 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.<sup>17</sup>

Finally, chapter four will introduce a new technology under development in Korea, the portable Internet. Developers are promising eventual speeds of the wireless Internet based, all IP infrastructure to reach 30 – 50 Mbit/s to slow-moving users.

### 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 1990's have played a major role in shaping the industry.

Korea's ascension as a leading telecommunication economy 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 the turning point for Korea in its progress to its leading mobile communication and ICT position (see Box 3.4).

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 PCS<sup>18</sup> 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 3.4: Difficult decisions surrounding early CDMA adoption**

*How the Korean Government's early decision to promote CDMA technology has paid off handsomely.*

The Korean Government's decision to focus on CDMA technologies has been one of its most visionary and profitable decisions in the Korean ICT sector. However, from Korea's current level of success, it is hard to imagine the decisions and risks policy-makers were faced with in the early 1990's 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 13 per cent in 2002, representing nearly 110 million subscribers around the world.

*Source: MIC.*

### 3.3.1 Policy decisions

As mentioned previously 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 WCDMA 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 will be used mainly for data, then carriers will use CDMA2000 1x and WCDMA networks to carry the bulk of their voice traffic.

However, if the WCDMA network will be used primarily for voice, the economics of building out an entirely new network are going to be difficult for the operators to work with. From a cost perspective, they may choose rather to expand and upgrade their existing CDMA2000 1x towers around the country at much lower cost. The future of WCDMA and CDMA2000 networks in Korea will also play a key role in another government policy decision, handset subsidization.

#### *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 per-minute 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. This has not been a problem as the mobile market had hit a critical mass and users were 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 WCDMA adoption. The question Korean policy makers are facing though is how strongly they should push the WCDMA technology. By giving handset subsidies on WCDMA 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 cannibalise the golden goose.

#### *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 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.

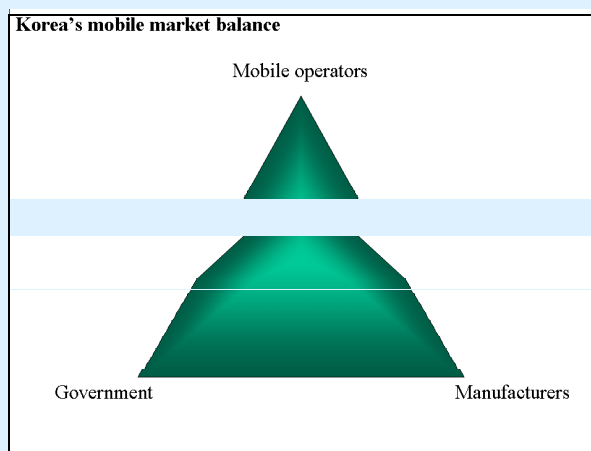
The mobile triangle is made up of three key players: the Government, the mobile operators, and equipment manufacturers. Together the three parts work to collectively promote the mobile industry, through settling on standards, policies, and business models that can help lead to the best possible outcome 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 (see Figure 3.3) 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 WCDMA will look like.

**Figure 3.3: Korea's mobile market triangle**

*The delicate balance between the interests of government, mobile operators, and handset manufacturers*



Source: ITU.

### WIPI

Another key example of Korea's mobile market triangle is tied to the discussion around WIPI, 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 its GVM, 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.

### Number portability

MIC has levelled 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, and current phase, users are only able to take their numbers with them when they move *away* from SKT to other providers. It will not work 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 has been a huge initial success 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.

### 3.3.2 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

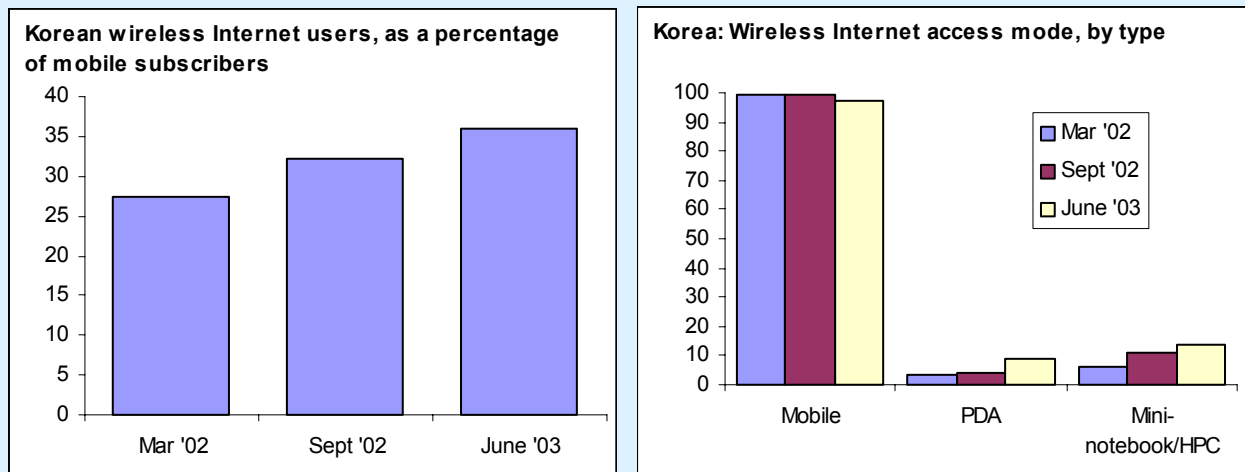
While the mobile networks play a key role in Korea's high mobile penetration rates, it is the services on the network that attract Korean users. Some of the most popular and newest service offerings are discussed below and include wireless Internet, multimedia, m-commerce and mobile gaming.

#### *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. An astounding 36.1 per cent of mobile phone users have used the wireless Internet in the past six months (see Figure 4.1). The average is higher for women (38.9 per cent) than men (34.1 per cent).

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

*36.1 per cent of all mobile phone users have used the wireless Internet at least once in the past six months with mobile phones being the preferred access method*



*Note:* Wireless Internet access mode, by type will sum to greater than 100 per cent as some subs may use multiple terminal types.

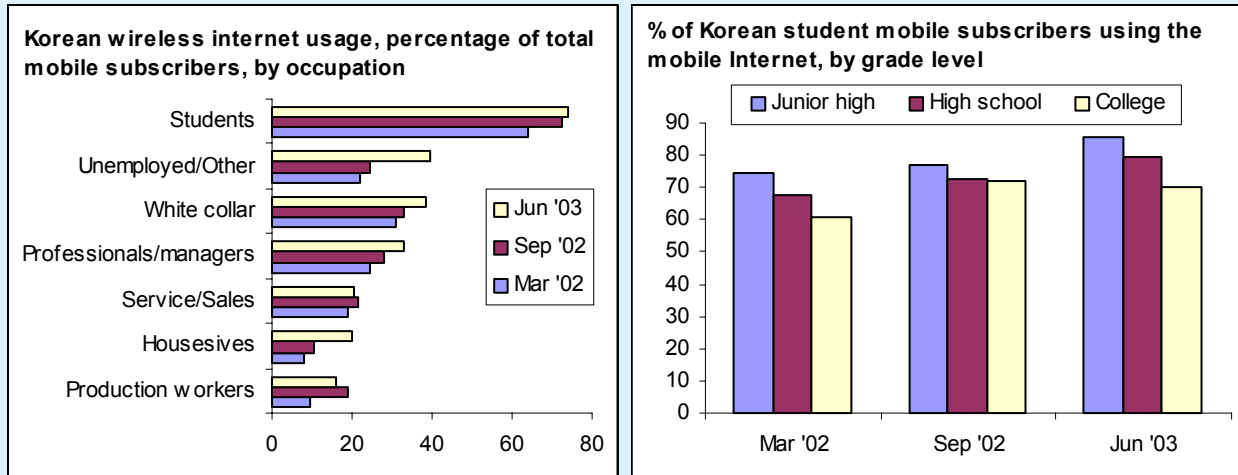
*Source:* KRNIC.

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. Section five will discuss the phenomenon in more detail.

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.

**Figure 4.2: Students poring over the wireless Internet**

*Junior high school students are the heaviest wireless Internet users in Korea with students in general using it far more than the general public*



Source: KRNIC.

### M-Commerce

Koreans can use their mobile phones to pay from 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 offline via mobile terminals. Mobile phones on Korean CDMA networks don't use the common GSM SIM card 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 the chips is transmitted in two ways, either via the IR port on the top of the phone or over by using radio frequencies. There are more than 470,000 locations nationwide that will accept m-payments<sup>19</sup> (see Box 4.4 for information on SKT's m-commerce solution, Moneta).

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.

#### **Box 4.4: 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 Moneta terminals were first installed in another branch of SK's businesses, petrol stations.

#### *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.<sup>20</sup>

#### *Video services*

Video services over mobile phones have been a huge success in Korea, too successful in fact. Initial video-on-demand offerings by SKT were so successful that the mobile network ground to a near halt with the huge amounts of traffic (see Box 4.5).

**Box 4.5: Bandwidth killed the mobile video star**

*SKT's service so popular it brought traffic to a standstill*

SKT learned quickly in 2003 about how important pricing is to network health when it launched its “JUNE” EV-DO video-on-demand service. JUNE subscribers paid a monthly flat rate of US\$ 17 (20'000 Won) for video data traffic and then US\$ 0.85 (1'000 Won) for each movie they watched. The users were essentially paying a dollar for each movie and then a flat rate for the data connections the movies floated over. Mobile subscribers couldn't resist being able to watch their favourite movies during their long commutes and the service was an astounding success.

While strong consumer interest is usually music to a mobile provider's ears, SKT's network began to buckle under its own success. There were simply too many users who were downloading movies and videos at US\$ 0.85 each and too little bandwidth in the spectrum to accommodate them.

SKT was forced to discontinue the service under the existing pricing plan and move to a per packet charge on the video data. The US\$ 0.85 “rental charge” remained the same but data charges jumped from US\$ 17 per month unlimited to roughly US\$ 60 per movie. Because the change in policy was so swift, some users didn't realize the price of watching a movie had jumped astronomically and received huge bills the following month.

SKT has not given up on the idea of flat-rate pricing for movies. However, any new flat-rate pricing plans will most likely have an upper limit similar to the broadband bit caps common in some parts of the world.

*Source: SKT.*

SKT success with video services over mobile networks has been 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 4.6).

**Box 4.6 : 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 phone from Samsung has finally brought over-the-air television reception to the mobile phone.

Samsung's SCH-X80 has a built-in TV tuner that receives TV broadcasts directly from terrestrial towers free of charge. While the



*Source: <http://www.etchkorea.info/articles/20030616001.php>.*

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. While mobile networks struggle with limited bandwidth, mobile phone manufacturers are already looking towards a different model of video provision from historically successful terrestrial and satellite video providers.

Satellite and terrestrial networks are allocated a limited amount of bandwidth and need to reach a wide audience. Their bandwidth allocations are not sufficient to allow users to stream video on demand. Given SKT's experiment with video-on-demand, operators and equipment manufacturers are taking a lesson from

traditional television. They are embracing the traditional broadcasting method of delivering video to their devices.

Korean operators and mobile phone manufacturers are embracing digital media broadcasting (DMB). With DMB, a mobile phone or PDA essential becomes a receiver for satellite subscription television. Just as home satellite dish users, mobile phone and PDA users will be able to subscribe to services and watch broadcasted 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 and is discussed further in section 4.

### *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 online gaming surpassed that of 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 (see Box 4.7).

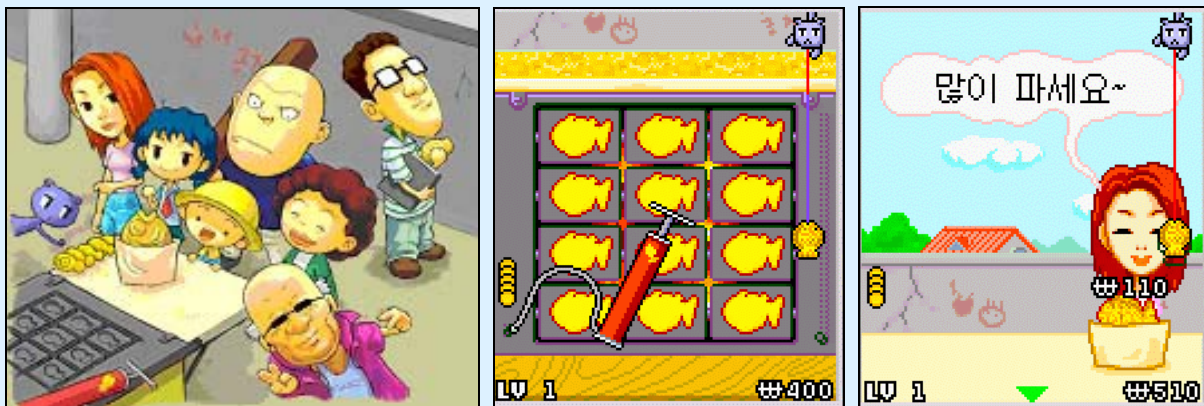
#### **Box 4.7 : Mobile gamers in Korea heed the call to “Com2Us”**

*Small games for mobiles are big business in Korea*

Koreans love games. Online gaming has been a big driver for broadband take-up but it may also start helping influence which mobile provider users select. Com2Us is a Korean game manufacturer that has specialized in producing games that are played on mobile phones and its games are appearing around the globe.

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 and other mobile games cost an average of 2000 Won. In addition to the cost of the download, users must pay “packet fees” to the mobile provider for Internet usage. The games are usually around 120 K and packet costs would be close to 600 Won.



Source: Com2Us.

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 and are a one-time payment to the operator. However, RPG’s typically require a connection to the network to interact with other players, providing a lucrative stream of revenues to mobile operators. That creates an ambiguous future for mobile RPGs. Game developers are hesitant to develop more RPG’s 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.

### *Music*

Music is a 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. While the rest of the world is still languishing with monophonic ring tones, new Korean phones can reproduce 64 phonics (or 64 different notes) at one time. The difference in quality is astounding.

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 in Korea (see Box 4.8)

Korean operators have also built new music services into interesting business ideas. While ring tones 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 Colorryng 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.

### *Other services*

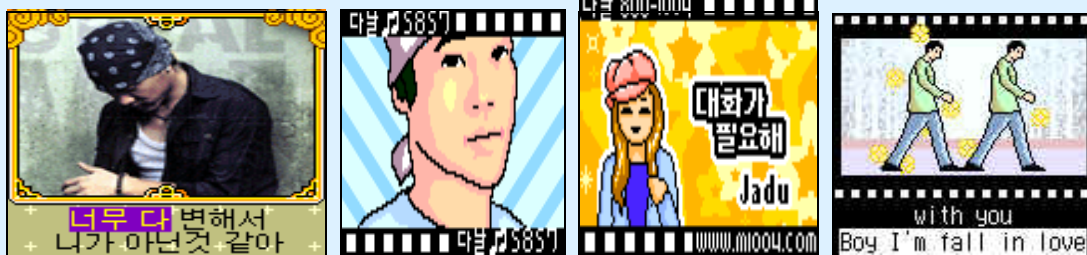
The mobile Internet, multimedia services and games are only a part of the total services available to Korean mobile subscribers. Several other interesting applications are becoming popular among users.

#### **Box 4.8 : The end of the Korean singing room (Norae Bang)?**

*How mobile phones have taken business from traditional Karaoke rooms.*

Korean Norae Bangs (Karaoke song rooms) have been a staple of Korean entertainment for years. However, traditional Norae Bangs are starting to feel increasing pressure from services offered by mobile providers. Instead of renting a Norae Bang by the hour, Koreans can download songs, and their accompanying characters directly to their phones. Korean polyphonic phones with 40 phonic sounds reproduce excellent music while a very good caricature of the performer dances and moves on the upper portion of the screen. The screen's lower section displays the lyrics to the song that change colour just as they are supposed to be sung.

DANAL is Korea's leading provider of mobile karaoke and offers music file downloads in a variety of qualities. Currently songs can be downloaded in 1, 4, 16, and 40 "polys", representing the number of musical notes that can be played at a time. Prices vary based on the poly quality and range from US\$ 0.25 to US\$ 0.50 (300-600 Won) per song. Downloaded songs can be saved indefinitely on the phone. Users on all three Korean mobile networks have access to karaoke on the go. Given Koreans' love of singing, the service is turning out to be a huge success.



Source: DANAL Co. at <http://www.danal.co.kr>.

#### *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 the phone. The ease of play has greatly increased user participation in the lottery, with several groups claiming it is helping fuel gambling addiction.

#### *E-books*

Korea's Confucian emphasis on education can help explain the importance of books in Korean society. It is then 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), nearly 40 per cent off the cover price for the paper version. The book's text without pictures and can be read straight from a mobile phone. Com2Us is one e-book provider and shares the revenues with Booktopia, the collective licensing scheme. 60 per cent of the revenues go to the authors through the collective scheme while 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. These terminals make it quickly into the hands of Korean consumers with some estimates indicating that users upgrade their handsets every eight or nine months.<sup>21</sup>

Korea's large 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.

Korean handset manufacturers, overall, have been gaining significant world market share with Samsung ranking third worldwide and LG also showing well at fifth for total handset sales (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. Samsung's rise as a mobile terminal provider has been the most spectacular. In 2002, Interbrand named Samsung the world's fastest growing brand overall, with much of the success most likely tied to its growth in the handheld market.

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 after a long spell of shrinking sizes. Third, users are upgrading their handsets ever more frequently and facilitating a rapid research and development drive by handset manufacturers.

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**Table 4.1: Worldwide terminal sales to end-users**

| Company        | 3Q03 Sales (thousands) | 3Q03 Market Share (%) |
|----------------|------------------------|-----------------------|
| Nokia          | 45,380.8               | 34.2                  |
| Motorola       | 19,484.3               | 14.7                  |
| <b>Samsung</b> | 14,837.4               | 11.2                  |
| Siemens        | 12,110.4               | 9.1                   |
| <b>LG</b>      | 7,081.9                | 5.3                   |
| Sony Ericsson  | 7,065.1                | 5.3                   |
| Others         | 26,883.8               | 20.2                  |
| Total Market   | 132,843.7              | 100                   |

Source: Gartner, [http://www4.gartner.com/5\\_about/press\\_releases/pr8dec2003c.jsp](http://www4.gartner.com/5_about/press_releases/pr8dec2003c.jsp).

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#### *PDA and mobile phone convergence*

Korean handset manufacturers build both mobile phones and PDAs although the features for each may essentially be the same. Koreans tend to favour smaller devices and have traditionally preferred using a mobile phone to access information on the go. This is in contrast to the large PDA market in the United States where users seem to care more about having a larger viewing area and less about the overall size of the device.

As a result of the differences in worldwide tastes, Korean handset manufacturers build both types of devices and they are increasingly incorporating the same features in both camps. Mobile phones commonly have features found on a PDA such as personal information management (PIM) capabilities while PDA's are receiving phone functionality. While Koreans have a different name for each type of device based on whether it is a mobile phone with PDA-type capabilities (Smartphone) or a PDA with phone capabilities (PDA), the term Smartphone seems to be broadening to include both (see Box 4.9).

#### **Box 4.9 : The convergence of mobile phones, PDA, and digital cameras**

*How one mobile device may take the place of all three*

LG electronics chose ITU Telecom 2003 as the site to unveil its most recent PDA/phone offering, the SC-8000 and KC-8000. The terminal is essentially three devices in one.

##### **PDA**

It is a full functioning PDA running the Korean version of PocketPC 2003 on a 400Mhz Xscale processor. It includes 64 megabytes of RAM dedicated to the PocketPC with another 128 megabytes of internal memory to store multimedia. The PDA also include expandable memory card slots.

##### **Phone**

CDMA2000-1x EVDO (Korean version) with a GSM version also introduced for foreign markets.

##### **Camera**

The built-in camera has a resolution of 1.1 mega pixels and can also record full-motion video. Images and video can be stored internally or on an external memory card.



Samsung's new PDA offering, the MITs M400, takes convergence even a step further.

##### **TV**

The M400 has a built-in TV tuner that allows users to tune into terrestrial broadcast signals. The 3.5 inch display makes for easy viewing.

##### **GPS**

Many PDA's have GPS functionality through plug-ins that attach to the device via a memory card slot. However, the M400 has an integrated GPS so there is no need for external attachments.

##### **Walkie Talkie**

The Samsung M400 is also the first PDA to offer (2-way radio) functionality..

Source: LG, Samsung.

#### *Terminal sizes*

Koreans have traditionally preferred the smallest handsets available on the market and phones decreased in size until just recently. In late 2001, typical mobile phones were roughly half the size of phones common in downtown Seoul today. Koreans seem to have decided to accept larger phones if they are packed with more and more features. Korean handset manufacturers are still building small phones (see Box 3.10) but larger models are now dominating the market. The new trend of larger handsets is not surprising given Koreans can now carry one device that functions as phone, PDA and camera.

Some of the size difference between earlier handsets and their current larger counterparts can be attributed to larger displays. Handset manufacturers have said that the trend will likely continue with display sizes becoming even larger.

At present, most phone displays are quarter common intermediate format (QCIF) with a resolution of 176 x 144 pixels, corresponding to roughly 1.8 inches. However, the next step will be quarter video graphics array (QVGA) and its higher resolution of 320 x 240, or roughly 2.2 inches (see Table 4.2 and Figure 4.3).

**Table 4.2: Mobile display sizes**

|                           |                  |
|---------------------------|------------------|
| <i>QCIF (quarter CIF)</i> | <i>176 x 144</i> |
| <i>CIF</i>                | <i>352 x 288</i> |
| <i>QVGA (quarter VGA)</i> | <i>320 x 240</i> |
| <i>VGA</i>                | <i>640 x 480</i> |

Source: LG Electronics.

**Figure 4.3: Cell phone display sizes**

*The future trend in mobile display sizes is to move from QCIF to QVGA, allowing for much more information to be displayed on the screen and read.*



QCIF (176x144)



QVGA (320x240)

Source: ITU.

**Box 4.10: Dick Tracy is alive and well at Samsung**

*Samsung's wristwatch phone does much more than keep time*



In March 2003, Samsung unveiled its GPRS Class 10 phone that is built as mobile phone wristwatch. The watch's battery can provide up to 1.5 hours of talk time and 80 hours on standby. Some special features include a built-in phone book, voice activated dialing, a speakerphone, and a bright 256 OLED (Organic Light Emitting Display) colour screen with 96 x 64 pixel resolution. While the phone is missing the camera functionality in the original Dick Tracy watch, the look is nearly identical to the watch in the famous cartoon strip.

Source: Samsung.

### 4.3 Conclusions

One thing that has become clear in the Korean market for mobile phones, is that users are demanding more from the 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 mobile. But 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 The converged network – ubiquitous connectivity

### 5.1 The Korean vision: Broadband converged network

The line of distinction between 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 other wireless access networks (e.g. Hanaro Broadband). At the same time, mobile phone technologies are starting to reach broadband-type speeds. Convergence is nigh and the new 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 converged network and how that vision is currently becoming a reality.

*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).

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

*The difficulty 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.

##### **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 **one 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. With nearly 70 per cent of households connected to broadband, it is natural that the converged network have a new, strong emphasis on broadband. This is reflected in the newest iteration of the network's name.

Regardless of the current or final name decided for the converged 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.

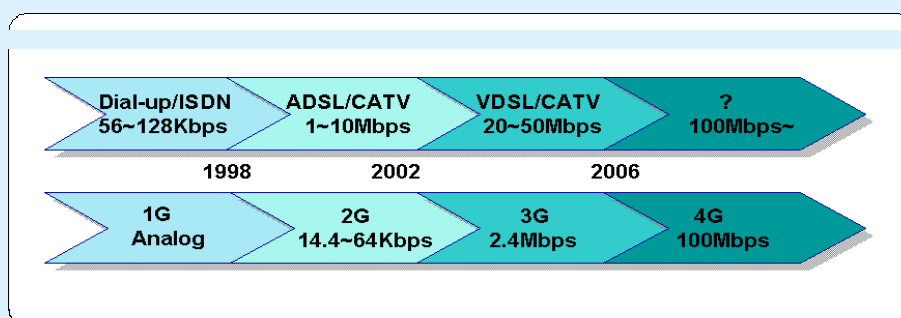
*Source: NCA.*

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.”<sup>22</sup>

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).

**Figure 5.1: Korea's BCN timeline**



Source: NCA.

Combining so many different information sources together creates many technological and political challenges. This section will first spell out what the BCN 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 smooth functioning of the BCN.

## 5.2 Broadband converged network breakdown

In order to fully understand the BCN, it's vital to understand where different network elements fall into place in the wide 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 5.2). 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 is 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.

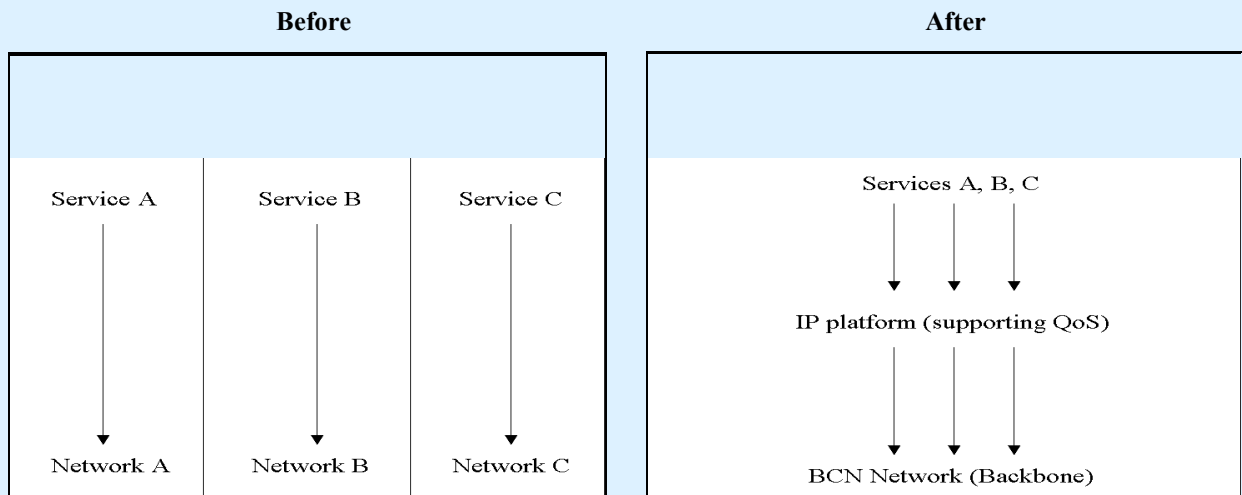
## 5.3 Korea's revolutionary network plan: The Portable Internet

In many countries, mobile operators have envisioned being able to encroach on broadband's market through 3G 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 them very difficult to use in moving vehicles. Mobile networks, on the other hand, don't have enough bandwidth

to offer truly broadband-type connectivity, as was highlighted by SK Telecom’s experiment with video-on-demand on its CDMA network.

**Figure 5.2: The move towards one network, many services**

The Korean vision of the BCN can be broken down into “before and after” 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.

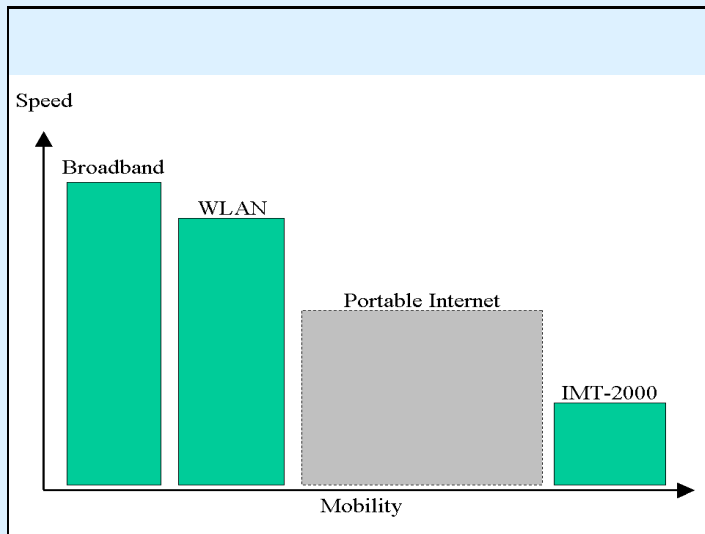
Korea’s policy makers, broadband providers, and mobile operators have therefore come up with a plan to develop a new data network that is more efficient at offering mobile data than either broadband or mobile. This plan is called the Portable Internet. The Portable Internet is a technology that fits well between WLAN and IMT-2000 in terms of mobility and speed (see Figure 5.3, left). It would offer a 1 Mbit/s connection to users for a flat monthly fee. Operators have not said how much they will charge but industry watchers assume the prices will be about US\$ 15.<sup>23</sup>

All major telecommunication players in Korea have plans for the 2.3 GHz plan once/if it is approved. KT, for example, has already introduced a “seamless” offering through its Nespot Swing, a bundled package that where users can roam between Wi-Fi hotspots and the CDMA2000 1x EVDO network, when out of Wi-Fi range. The Portable Internet promises to further expand SKT’s network in a much more cost-effective manner than CDMA. Because of their limited bandwidth availability, CDMA networks are only cost effective for voice and non data-intensive applications.

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, the Portable Internet will be accessible in a 1 km radius around a base station and be accessible at speeds around 60 km/h (see Figure 5.3, right). Mobile carriers are especially interested in the Portable Internet 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 5.3: The “Portable Internet” could fill the speed and mobility gap**



| Portable Internet at a glance       |                        |
|-------------------------------------|------------------------|
| General                             |                        |
| Frequency:                          | 2.3 GHz                |
| Licenses:                           | Awarded by ministry    |
| 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.

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

Korean handset manufacturers are also interested in the portable Internet 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 may have the ability to access the different types of networks: CDMA2000 1X, WCDMA, Wi-Fi, and the portable Internet. Both Samsung and LG made 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.

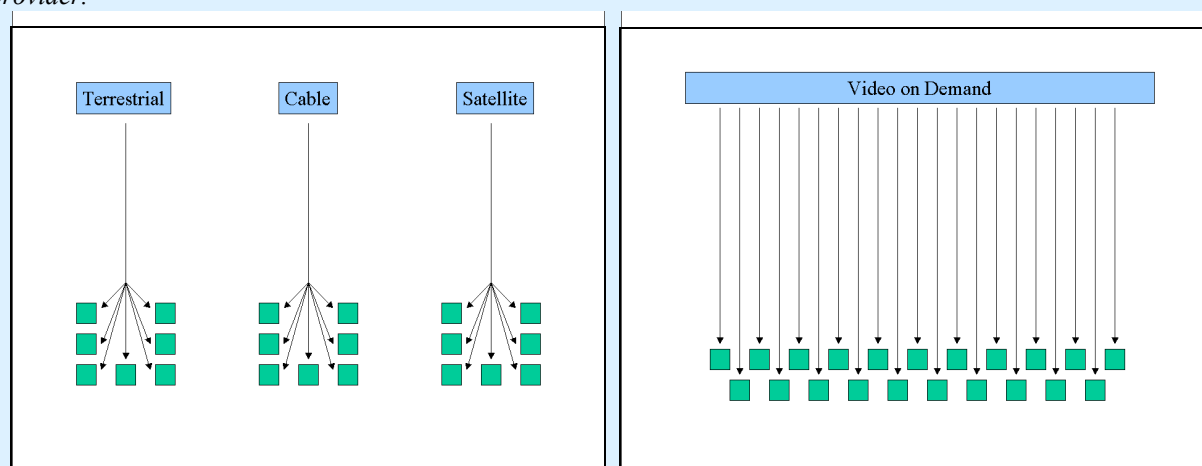
While the different telecommunication entities in Korea may agree on a need for the portable Internet in Korea, there is less harmonization in the actual design of the network. Korea’s ETRI has developed a plan for the Portable Internet known as HPI, while other groups are pushing for slightly different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

#### 5.4 Digital media broadcasting (DMB)

While the portable Internet address the need for cheaper mobile data, Korea’s broadband converged network will also include a video component known as Digital Media Broadcasting (DMB).<sup>24</sup> 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 problem with the underlying economics of video-on-demand distribution. Terrestrial, satellite, and cable television use one single stream of a channel to service all subscribers in a given area, making very effective use of limited bandwidth. VoD is inefficient because each individual subscriber requires a separate stream from the server (see Figure 5.4). 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.

#### Figure 5.4: The bandwidth inefficiencies of video-on-demand

Traditional terrestrial, cable and satellite broadcasters use one video stream to service all the subscribers in an area. The same stream essentially passes every subscriber's television and users simply "pull it in" when they turn on the television. This means one single stream for any of the providers in the left Figure could be accessed by all 21 subscribers. Video-on-demand (right Figure) requires a separate stream for each user on the network, even if the programming is identical for all 21 subscribers. This increases costs both in bandwidth and server costs to the video provider.



Source: ITU.

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 manufacturers 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 (see Box 5.2). DMB pricing plans will probably be 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.

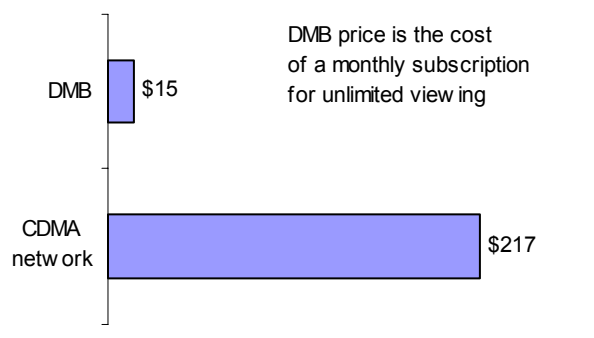
Digital satellite television services have been a huge success around the world, partially because technology has increased the number of channels available to subscribers. Digital satellite television compresses signals to allow for a large number of channels to subscribers. It is not uncommon for subscribers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

### Box 5.2 : Paying for video on a mobile

*How the costs of video on a mobile can run the gamut in Korea*

Koreans wanting to watch video on their mobile phones will soon have several options, some of which are vastly more expensive than others. Today, users can stream movies over the existing CDMA2000 network but the costs are astronomical. However, soon Koreans will have a much cheaper alternative, satellite TV that they can watch on their mobile phone or PDA via digital media broadcasting (DMB). DMB users will pay a flat rate for a monthly subscription to satellite TV and can watch it as often as they like. This is in sharp contrast to the fees users must pay if they choose to stream videos on demand over the cellular phone networks.

**Cost of watching a 2-hour movie on a mobile phone, US\$, by network**



In sharp contrast, KTF's EV-DO users can view video streamed at 110 Kbit/s at a cost of 35.75 Won (US\$ 0.03) a second. A user need only watch just over 8 minutes of video off the CDMA network to equal the cost of a monthly subscription to DMB. The vast differences in prices highlight the expense of providing video over mobile telephone networks.

*Source: KTF.*

## 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 broadband converged network 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.

### *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.<sup>25</sup> 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 5.3). 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 5.3 : 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 5 per cent to 10 per cent of the total information fee, based on mutual consultations between both 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. color displays and 4/16/64 polyphonic tones) so that the content provider may offer market-specific content and services to its users.

*Source:* ICA.

*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. The current Internet addressing scheme "IPv4" may suffer from a shortage of addresses, 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.<sup>26</sup>

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.

*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). This is a technical feat because phone directories aren't compatible with the Internet directories, and vice versa. VoIP users often don't have phone numbers and instead are contacted via an IP address. The phone directories and Internet directories need an effective way to share directories in order to pass calls back and forth. One solution under consideration in Korea is ENUM. ENUM is a method to merge the Public Switched Telephone Network (PSTN) with the IP network's IP addressing system by "mapping" a telephone number into a typical Uniform Resource Locator (URL). ENUM could help lay the foundation of the Korean broadband converged network by combining two different directory structures, the domain name system (DNS) and the PSTN numbering system.

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 handling over 100,000 users. The Ministry of Information and Communication has set aside US\$ 300,000 to test the system and the service is expected to be commercialized in 2004.

### *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 Nespost Swing as a viable solution. However, how payments will be made to respective infrastructure is much more difficult and a process that will take some time to work out.

#### *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 2.0 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 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.

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 5.4). This particular business model has been successful in Korea and has shown a true desire for converged network services.

#### **Box 5.4: Samsung's converged fixed and mobile phones**

*Internal calls free among one another within the building but becomes 3G phone 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 Korean mobile providers, mobile handsets that become part of the WPABX 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 to the plan, the company chooses one mobile carrier for all its employees. 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.

*Source: Samsung, SKT.*

## **5.6 Policy implications**

Korea's move towards a broadband converged network 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 broadband converged network will likely rest, to a large extent, on the policy decisions made now.

### *Voice*

In a converged network, there may be 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 in by the explosive growth of voice over IP, data traffic tends to find its way to cheaper transportation 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 choose to avoid.

The regulatory implications for voice traffic will be large. Traditional regulatory schemes involving universal voice service must be drastically 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.

The Korean Government is also close to assigning a prefix code for VoIP numbers. This will be an important step since it would allow 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.

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 broadband converged network, 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”.

#### *Universal service requirements*

Universal service requirements have long been a staple of voice telecommunication policy but have 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.

#### *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. 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.

#### *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 difficulty 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 them 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 mobile information 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.

Korea’s burgeoning of information has both benefits and drawbacks. The success of Korea’s mobile information 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 mobile connectivity. What is clear is Koreans will need a way to “unplug” from information when they want.

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

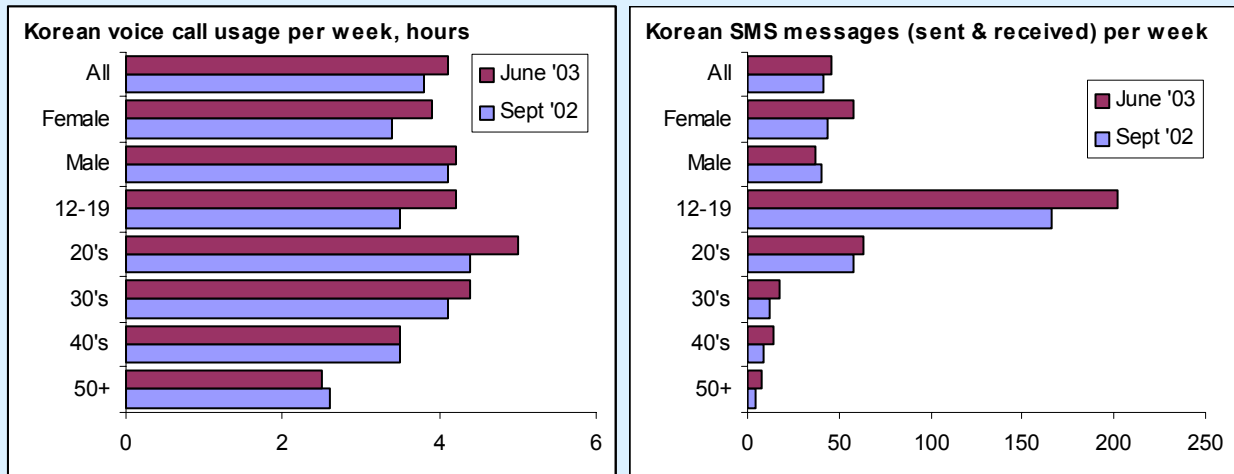
### **6.1 Social benefits — The Korean experience**

*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 Koreans<sup>27</sup>. 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 usage in Korea**

*Koreans use their mobile phones an average of 4.1 hours per week and send/receive 41.7 SMS messages.*



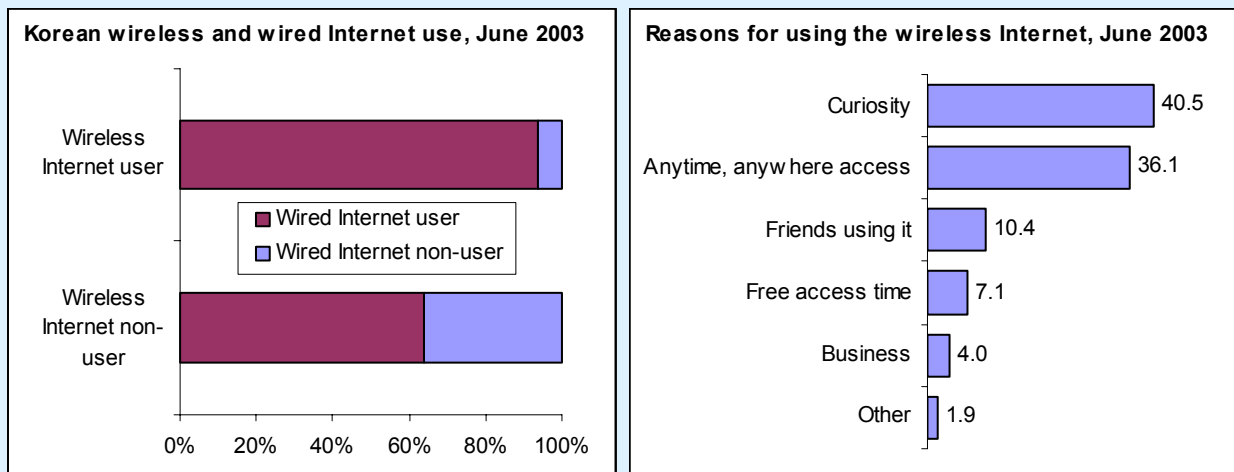
Source: KRNIC.

Koreans apply the same vigor to shopping in the middle of the night at DongDaeMoon to the mobile connectivity. Koreans are heavy mobile users with a typical user making 4.1 hours of calls a week, roughly 1000 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.

Interestingly, there is a high correlation among Korean wired and wireless Internet users. This highlights the complementary relationship among the two access technologies. Rather than substituting mobile Internet access for fixed access, users find both important. 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.

**Figure 6.2: Wireless Internet use**

*The complementary relationship between the wired and wireless Internet*



Source: KRNIC.

Korean operators have been very 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.

### *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 country<sup>28</sup>.

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/](http://www.sktelecom.com/english/cyberpr/pr_center/exhibitions/) and <http://www.samsung.com/HomeNetwork/SAMSUNGhomevita/Achievements/Pilot.htm>.

### *Mobile phones as wallets*

All Korean mobile operators have a system that allows their subscribers to make payments via their mobile phones (see also section 3). By including a SIM module in each new handset, phones can be used as a wallet for m-commerce. While some have been surprised at the brisk take-up of these services in Korea, the trend is mimicking a trend that started a few years back, the Koreans' love of credit cards.

In 1995, credit cards were new to the Korean market and very few Koreans had or used them. However, in 2002, the average Korean consumer had four credit cards.<sup>29</sup> While banks have been the beneficiaries of this credit boom, mobile operators are hoping for a slice of the revenues by teaming up with nationwide banks to offer m-commerce products.

### *Mobile phones as keys*

While an m-commerce enabled phone may be the key to a users bank account, it is also rapidly becoming the key to their apartment as well. Smart chips embedded in mobile phones can be used to open new high-tech door handles that are being installed around the country in residences. In an interesting twist, users can also use the smart chip embedded in a credit card to open the door as well (see Box 6.2).

**Box 6.2: Mobile phones as keys**

*How mobile phones in Korea are replacing keys*

Koreans have found a better to find a set of misplaced keys. They simply call them. New doorknobs are popping up all over the country that let users open their doors via their mobile handset, or any card with a smart chip embedded in it. The new door handles do away with the need of making copies of keys. Instead, the door can “memorize” any “Type A” smart-chip card and allow or deny it entry based on the homeowner’s settings.

Euro Electronics makes a popular door handle that uses the smart chip technology to control access. The door handle contains a proximity smart card access door lock system. When a mobile phone or credit card, with a smart chip installed, is waved in front of the door handle, the chip can be read by electromagnetism induction at the 13.56 MHz frequency. This unlocks the door for a brief period of time, long enough to push or pull the handle to open the door. Users could theoretically open the door without using their hands (e.g. while carrying bags as shown below). With a mobile phone in their coat pocket, they could move up against the door, close enough for the chip to be read. Then, opening the door is simply a matter of pushing on the handle with their arm.



Source: <http://www.eetimes.com/pressreleases/bizwire/116028>.

*Post PC*

Korean’s are looking forward to the next generation of mobile computing devices, 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 (see Box 6.3).

### Box 6.3 : Samsung's "wearable" computer mouse and keyboard

*How the Korean electronics firm hopes to change the paradigm for text input on mobile devices*

The film Johnny Mnemonic (1995) was one of the first films to show an actor navigating through a computer by using gloves and hand movements. Samsung Electronics has taken a step towards making this vision a reality by introducing "Scurry".

Scurry is an input device that resembles a shiny bicycle glove. It functions as a wearable mouse that can be used to type in data into a computing device. Scurry can function as both a mouse and keyboard, allowing users of wearable computers to quickly input information.



Once Scurry reaches mass production, it will come in two different models: a glove and a ring. The two devices will be able to sense changes in the angle and positioning of fingers. These movements can then be relayed to the computer where they are interpreted. Despite the strong interest, the market for wearable computers and other Post PCs has not developed to the point that Scurry could go into mass production economically.

*Source:* The Korea Times: Samsung Develops World's First Wearable 'Mouse' at: <http://times.hankooki.com/lpage/biz/200312/kt2003122417420911910.htm>. Photo: CNN.com (by Daniel Sieberg).

### *Telematics*

Koreans are keenly interested in telematics, 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.<sup>30</sup> 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.

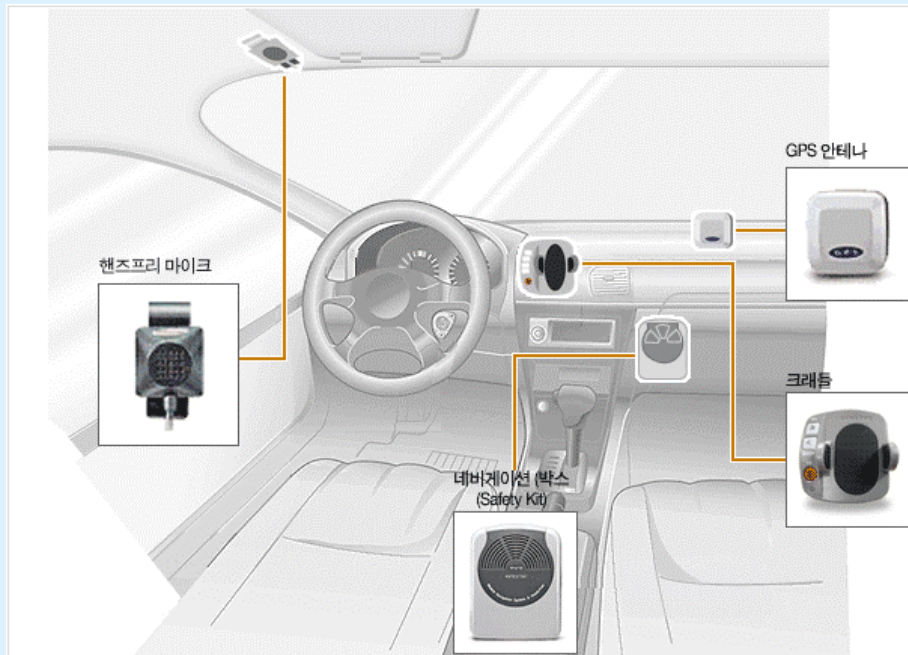
Mobile, and even fixed line operators, are looking for telematics to be a boon for business. The country's three mobile operators, SKT, KTF and LGT have all declared their entry into telematics with fixed-line provider KT also announcing telematic plans (see Box 6.4).

### *Location-based services*

The key component that makes location-based services possible in Korea is the Global Positioning System (GPS). Even now, Koreans 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 (see Figure 6.3). Users can find directions using voice commands or by moving through a set of menus on the phone.

**Figure 6.3: Nate Drive Setup**

Components (left to right). Handsfree mike, mobile phone cradle, navigation box, GPS antenna



Source: SKT at <http://drive.nate.com>.

**Box 6.4 : 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 6.5).

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 drivers that would lead them to less-congested roads.

**Box 6.5 : 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 mobile 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 have a difficult time separating themselves from work and the mobile technologies have further 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 mobile information society may have negative social effects on human interaction. All three of these elements will be discussed in this section.

### *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 Korea would be an optimal testbed for teleworking. However, the idea of working from home has not been accepted in Korean culture. It is vital for workers to be in the office each day, usually in view 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 compliment, 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 (see Box 6.6).

**Box 6.6 : BYOMP to work (Bring your own mobile phone)**

*How Korean business expects workers to supply their own mobile phones for the job*

In many parts of the world, companies issue mobile phones with calling plans to employees who need to stay in contact wherever they are. In Korea however, employees are usually expected to bring their own phone to work, and pay for any work-related mobile calls out of their own pocket. This can be particularly expensive when employees roam internationally for business or must keep in constant contact with foreign associates or branches.

Korean workers wouldn't even consider submitting the calls they make on their mobile phone to the company for reimbursement any more than they would bill the company for a new pair of business shoes. It's simply a cost of having a job, much like paying the subway fare to get from home to work in the morning.

In addition, the current trend in business is to have business cards that include personal mobile phone numbers. This effectively extends business further into Korean's everyday lives, by allowing them to be contacted day, night, weekends and holidays. While many would find this availability to be intrusive, Koreans view this as normal business practice.

While the idea of employees paying for work-related calls on their mobiles may be surprising, it is mitigated by the fact that Korean mobile phone tariffs remain relatively low. Mobile calls cost roughly US\$ 0.065 a minute (80 Won), definitely helping Koreans who need to constantly stay in contact for work.

*Source:* ITU.

### *Security in the mobile information 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 mobile information 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 old<sup>31</sup>. In Korea, stolen phones are usually reprogrammed and sold (see Box 6.7).

#### **Box 6.7 : Stopping illegal phone reprogramming in Korea**

*How the Korean Government hopes to cut down on the use of cloned cell phones*

Thieves in Korean have been using the serial number obtained from stolen phones to create “cloned phones” that are billed to the victims account. The phones can easily be reprogrammed using a simple computer program available on the web. Reprogrammed phones are then resold for about half the price of existing handsets and are commonly used by criminals in order to escape detection during crimes.

As a response, the MIC has installed eight undercover police officers at major mobile points of sale. Anyone caught cloning a cell phone faces up to three years in prison and a hefty fine of up to US\$ 17,000.

Source: CNET Asia, “Korea cracks down on cell phone cloning” at: <http://www.met.police.uk/crimeprevention/phone.htm>.

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 Protecting data in 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.

#### *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 6.8).

**Box 6.8 : 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 woman in the mok yok tang and then sold them to a popular web site.

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>.

## **6.4 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 (see Box 5.9).



**Box 6.9 : The changing subway in Korea's information society**

*How ten years of technology have completely changed the experience of riding the metro in Seoul*

In the early 1990's, Korea was just starting its development into an information technology powerhouse. However, certain elements of Korea's strong Confucian tradition were evident all around, including the subway. In the early 1990's a ride on the subway into downtown Seoul could easily take close to an hour from outlying areas and was memorable because of the lack of noise from the commuters. Ten years ago, the only sound heard on a ride on a subway train in Korea was that of the moving car.

Ten years later, the subway experience in Korea has changed immensely. Like in any other big city, commuters chat on cell phones and play games on their mobile phones. In addition, subway cars are equipped with hanging LCD televisions showing programmes such as popular soap operas all the way to Mr. Bean (see picture on right).

The increased noise on public transportation is probably common in all large cities as the number of mobile users increases. What makes Korea stand out is how the subway experience changed so drastically within a period of ten years. It highlights the importance Koreans place on communication and information technologies: a technology can have the impact of changing deeply-held ideas on where it is appropriate to make noise.



Source: ITU (text), Bill Lovegrove (left photo), Adam McLean (right photo).

*Mobile phone perceptions*

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 (see Box 6.10).

**Box 6.10 : Strangers and cell phones**

*How Koreans will let total strangers make quick calls on their mobile phones*

Korean pay phones are becoming more difficult to find, most likely as the result of high mobile phone penetration. This can make locating a pay phone a challenge. However, an interesting phenomenon is also reducing Korea's need for payphones – Korean mobile culture and generosity.

Asking a Korean on the streets of Seoul if they know where to find a payphone is commonly greeted with the following response, "Would you like to make a call on my mobile phone?" Complete strangers offer foreigners, and locals alike, usage of their phones for short local calls.

This is in sharp contrast to many mobile economies in the world where users are hesitant to allow even close friends and family use of their phones. However, Korea's low tariffs and sense of community have created a situation where the phone is no longer a luxury, but rather a tool of life that can be shared.

*Source: ITU.*

### Avatars

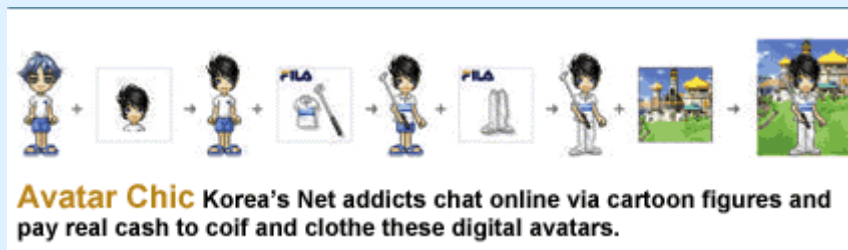
Korean culture has also changed drastically with the growing popularity of avatars. Avatars are cartoon representations of people that are used in virtual chat worlds and on mobile phones as screen savers (see Figure 6.4). Different from traditional chat programs where users employ a only a small picture 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 will be worth US\$ 114 million this year, up from US\$ 64 million the year before.<sup>32</sup>

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.

**Figure 6.4: Avatars**

*Avatars arrive wearing only underwear and must be "upgraded" by purchasing clothes and accessories*



*Source: Forbes at: [http://www.forbes.com/forbes/2003/0721/092\\_print.html](http://www.forbes.com/forbes/2003/0721/092_print.html).*

What avatars have shown about Koreans is that mobile phones are becoming a strong extension of self for many users. By personalizing their mobile phones with their avatars, the mobile phone becomes much more than a communication tool. It is an extension of either how a Korean views him or herself, or would like to.

## 7 Policy suggestions and conclusions

Mobile information 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. Korea also represents an excellent case study because of its vast broadband network and its experience of building a converged network for mobile connectivity. 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 mobile information 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.

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 mobile information 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 information 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 mobile information society will look like, but Koreans are on the verge of making it a reality.

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- <sup>1</sup> Data from the World Bank. Income given in gross national income per capita, PPP, atlas method.
- <sup>2</sup> ITU World Telecommunication Indicators Database.
- <sup>3</sup> See ITU Korean IT Case Study at: [http://www.itu.int/ITU-D/ict/cs/korea/material/CS\\_KOR.pdf](http://www.itu.int/ITU-D/ict/cs/korea/material/CS_KOR.pdf).
- <sup>4</sup> See the ETCA news release at: <https://www.ectaportal.com/uploads/1039DSL160502.doc>.
- <sup>5</sup> For more information on the investment see, "US group buys 39.6pct of S.Korea Hanaro for \$497mln" <http://www.forbes.com/technology/newswire/2003/11/18/rtr1152856.html>.
- <sup>6</sup> See Hanaro Telecom Achieves Operating Profit For FY 2002 (Bloomberg, 02/28/2003) at: [http://www.hanaro.com/eng/invest/press/ir\\_view.asp?keynum=69](http://www.hanaro.com/eng/invest/press/ir_view.asp?keynum=69).
- <sup>7</sup> See "South Korea: Living Laboratory for Broadband" at: [http://www.broadbandhomecentral.com/report/backissues/Report0301\\_4.html](http://www.broadbandhomecentral.com/report/backissues/Report0301_4.html).
- <sup>8</sup> See "Invaders from the land of broadband", Dec 11, 2003, [http://www.economist.com/business/displayStory.cfm?story\\_id=2287063](http://www.economist.com/business/displayStory.cfm?story_id=2287063).
- <sup>9</sup> IT Korea, November 2003 (Issue 4), International Cooperation Agency for Korea IT.
- <sup>10</sup> See World Markets Telecoms Daily, "South Korea: SK, KTF Reveal Contrasting Fortunes in Q4 2003" February 2, 2004.
- <sup>11</sup> IT Korea, November 2003 (Issue 4), page 100, International Cooperation Agency for Korea IT.
- <sup>12</sup> See "Korea eases 3G auction rules" at: [http://www.3gnewsroom.com/3g\\_news/jan\\_01/news\\_0209.shtml](http://www.3gnewsroom.com/3g_news/jan_01/news_0209.shtml).
- <sup>13</sup> In Korea, DBDM phones can offer seamless roaming between the CDMA2000 and WCDMA since both networks use ANSI-41. However, these phones will not yet allow roaming on GSM-MAP based WCDMA networks since there is no agreed-upon network-to-network interface.
- <sup>14</sup> 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.
- <sup>15</sup> ITU-R defines IMT-2000 enhancement as a multimedia service delivering 10 Mbit/s under fast moving conditions.
- <sup>16</sup> High Speed Wireless LAN will provide multimedia information at 500 Mbit/s – 1 Gbit/s for laptop computers or PDAs with 100m radius.
- <sup>17</sup> See MIC Internal Report, "Wireless Mobile Telecommunications Industry Promotion Plan," September 2003.
- <sup>18</sup> PCS represents CDMA service in the 1.8 GHz frequency band.
- <sup>19</sup> Welcome to e-Korea, Korea Agency for Digital Opportunity and Promotion, page 38.
- <sup>20</sup> See "Mobile banking transactions doubled in 2003" at: [http://www.koreaherald.co.kr/SITE/data/html\\_dir/2004/01/28/200401280037.asp](http://www.koreaherald.co.kr/SITE/data/html_dir/2004/01/28/200401280037.asp).
- <sup>21</sup> See "Samsung's Golden Touch" at <http://www.samsung.com/mea/english/news-040102a.htm>.
- <sup>22</sup> Shin Sang-Chul, "IT Infrastructure for Tomorrow with Korean Experience", October 2003, IST 2003.
- <sup>23</sup> See "Wiring Korea – Competition heats up for 2.3 GHz mobile Internet" at: <http://times.hankooki.com/lpage/tech/200306/kt2003060818544410840.htm>.
- <sup>24</sup> 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.
- <sup>25</sup> 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.
- <sup>26</sup> See "EU teams with Korea on IPv6 development" at: <http://news.zdnet.co.uk/communications/networks/0,39020345,39119162,00.htm>.

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- <sup>27</sup> The DongDaeMun market even has its own website: [www.dongdaemun.com](http://www.dongdaemun.com).
- <sup>28</sup> See IT Korea, January 2004 (Issue 5) at:  
[http://www.ica.or.kr/en/journal\\_read.asp?board\\_seq=250&seq=948&page=1](http://www.ica.or.kr/en/journal_read.asp?board_seq=250&seq=948&page=1).
- <sup>29</sup> See “Giving credit card firms a run for the money”, June 18, 2003, JungAng Daily.
- <sup>30</sup> See IT Korea, January 2004 (Issue 5), page 35 at:  
[http://www.ica.or.kr/en/journal\\_read.asp?board\\_seq=250&seq=948&page=1](http://www.ica.or.kr/en/journal_read.asp?board_seq=250&seq=948&page=1).
- <sup>31</sup> See “Safeguarding your mobile phone” from the Metropolitan Police at:  
<http://www.met.police.uk/crimeprevention/phone.htm>.
- <sup>32</sup> See “Is Another Bubble About to Pop in Korea?” at:  
[http://www.businessweek.com/magazine/content/03\\_39/b3851157\\_mz033.htm](http://www.businessweek.com/magazine/content/03_39/b3851157_mz033.htm).