Digital Development in Korea: Building an Information Society

DRAFT MANUSCRIPT

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Chapter 1: Digital Development as Korea’s Destiny

Korea is a mountainous peninsula, with mountains occupying over 70 percent of the land area. The mountain ridges and the rivers that flow through adjacent valleys form a dense network, clearly visible from space that has shaped Korean culture and patterns of human communication from time immemorial. As long ago as the Chosun Dynasty, smoke and fire beacons were used to speed communication throughout the nation’s mountainous terrain. Mountains are not just an indelible part of Korea’s physical world, but of her mentality and consciousness as well. The influence of mountains is deeply embedded in the emotions, knowledge, beliefs and values of Korea.¹ For example, mountain ridges play a central role in one of Korea’s treasured myths as expressed in the “Arirang” folk song.

Today a new, denser set of advanced, digital communication networks weaves its way throughout the southern half of the Korean peninsula. Less visible to the human eye, these fiber optic, mobile and satellite networks have propelled South Korea from a follower in electronics and telecommunications to a world leader in the field. One new report suggests its broadband networks, along with those of Japan, are half a generation ahead of other countries.² Taking into account both fixed and wireless services, Korea is now the world’s most digitally networked nation. The claim frequently appearing in the media that Korea is one of the most “wired” nations in the world is actually a misnomer, harking back to the day when copper wire was the heart of the public telephone network.

The mountainous terrain is one factor that led to South Korea’s dense pattern of urbanization, in which half the nation’s population lives in and around the capital city of Seoul. The nation’s large concentrations of urban apartment dwellers was one factor that accelerated the expansion of fiber-to the home (FTTH) and other new digital communication networks. Furthermore, these new networks are continually expanding and evolving, helping to shape one of the world’s leading information societies.

The primary focus of this book is on the role of digital communication in South Korea’s remarkably rapid development over the past three decades. No other country in the world achieved such success against such odds. As a 2003 report by the ITU (International Telecommunications Union) put it, “Korea is the leading example of a country rising from a low level of ICT access to one of the highest in


² Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 11.
the world. 3 An extensive study by the World Bank of Korea’s emergence as a knowledge economy came to essentially the same conclusion. 4

Given Korea’s mountainous terrain, its relative lack of natural resources, and the country’s utter devastation in the wake of the Korean War, it seems that digital development was the nation’s destiny. It represented a course that could be pursued through education and sustained human effort. That is reflected in our choice of a title for this book. On a global scale, as Cowhey and Aronson put it so succinctly, “The networked information infrastructure that blends computing and communications is the largest construction project in human history.” 5 Even in South Korea, which has land area approximately equivalent to the state of Indiana, building digital networks is a process that stretched out over decades.

Our focus on the role of ICT in development is accompanied by an interest in identifying those aspects of Korea’s experience that might be most applicable in the developing nations of the world. However, it would be a mistake to draw the inference that this book is only of interest and relevance to developing nations. To the contrary, it is now widely recognized that information and communication technologies (ICT), epitomized by broadband internet are at the core of national competitiveness strategies for developed and developing countries alike. Accordingly the recent national broadband plan in the U.S. drafted by the Federal Communications Commission benchmarks certain key features of Korea’s experience. 6

It is equally erroneous to assume, because we focus on Korea, that this book is aimed only at Asian area specialists or is some sort of narrow area study. In point of fact, the information revolution is a key defining feature of globalization and many important aspects of the information society in Korea touch on matters that are inherently global in scope. Moreover, in many nations around the world, ICT development is coming to be recognized as a basic human right.

The Declaration of Principles adopted by the World Summit on the Information Society in its 2003 meeting in Geneva said in part:

“We, the representatives of the peoples of the world . . . declare our common desire and commitment to build a people-centered, inclusive and development-oriented Information Society, where everyone can create, access, utilize and share information and

knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life, premised on the purposes and principles of the Charter of the United Nations and respecting fully and upholding the Universal Declaration of Human Rights.”

In this introductory chapter we describe the context for Korea’s rapid rise and some key aspects of its ascent to the vanguard of the global information society. We also outline our perspective on Korea’s digital development, referring to several important areas of scholarly literature that bear directly on the subject at hand. Finally, we conclude the chapter by noting some important historical antecedents of the revolutionary changes that began around 1980.

**The Context**

Our choice of a time period is dictated by both the course of the global revolution in information and communications technology (ICT) and by developments inside South Korea. In particular, two secular trends in the international political economy since 1980 helped to shape Korea’s strategic agenda and the restructuring of its telecommunications sector. The first of these was continued, rapid technological change and convergence in information and communications technology. The second was mounting pressure on Korea through bilateral and multilateral trade talks to liberalize its ICT sector. Political tumult and social circumstances within South Korea in 1980, and the decades that follow, complete the context for our study.

**Technological Change and Convergence**

Digital devices, starting with semiconductors are the engine of the information revolution. Their constantly growing power, smaller size and lower cost is expressed in Moore’s Law. His prediction, made in 1965, stated that the number of transistors on a chip would double about every two years.8 Two other laws suggest the larger significance of the contemporary revolution in computing and telecommunications. Metcalf’s law described the power of the internet, suggesting that the value of a telecommunications network is equal to the square of the number of connected users.9 McGuire’s Law states that the value of any product or service increases with its mobility.10

The IT revolution in South Korea, as elsewhere around the world, may be thought of in terms of four major waves of innovation, three of which are depicted in Figure 1.1.

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7 [http://www.itu.int/wsis/docs/geneva/official/dop.html](http://www.itu.int/wsis/docs/geneva/official/dop.html)
9 [http://www.seas.upenn.edu/~gaj1/metgg.html](http://www.seas.upenn.edu/~gaj1/metgg.html)
10 [http://mcgureslaw.com/](http://mcgureslaw.com/)
FIGURE 1.1 NEAR HERE
Figure 1.1: South Korea's Teledensity, Mobile and Internet Usage Trends

<table>
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<th>Year</th>
<th>Mobile Subscribers</th>
<th>Teledensity</th>
<th>Internet Usage</th>
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<tbody>
<tr>
<td>1990</td>
<td>3.5</td>
<td>31.0</td>
<td>0.25</td>
</tr>
<tr>
<td>1991</td>
<td>6.9</td>
<td>33.7</td>
<td>0.31</td>
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<tr>
<td>1992</td>
<td>14.9</td>
<td>35.7</td>
<td>0.81</td>
</tr>
<tr>
<td>1993</td>
<td>30.3</td>
<td>37.9</td>
<td>1.6</td>
</tr>
<tr>
<td>1994</td>
<td>50.7</td>
<td>39.7</td>
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<tr>
<td>1995</td>
<td>58.3</td>
<td>41.3</td>
<td>23.55</td>
</tr>
<tr>
<td>1996</td>
<td>61.4</td>
<td>43.2</td>
<td>41.01</td>
</tr>
<tr>
<td>1997</td>
<td>67.9</td>
<td>44.6</td>
<td>52.2</td>
</tr>
<tr>
<td>1998</td>
<td>70.2</td>
<td>43.5</td>
<td>59.8</td>
</tr>
<tr>
<td>1999</td>
<td>76.1</td>
<td>55.1</td>
<td>65.9</td>
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<tr>
<td>2000</td>
<td>94.7</td>
<td>55.3</td>
<td>70.6</td>
</tr>
<tr>
<td>2001</td>
<td>83.8</td>
<td>54.8</td>
<td>71.9</td>
</tr>
<tr>
<td>2002</td>
<td>90.2</td>
<td>55.3</td>
<td>74.1</td>
</tr>
<tr>
<td>2003</td>
<td>99.2</td>
<td>54.5</td>
<td>78.8</td>
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<tr>
<td>2004</td>
<td></td>
<td>52.9</td>
<td>81.6</td>
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<tr>
<td>2005</td>
<td></td>
<td>46.4</td>
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<tr>
<td>2006</td>
<td></td>
<td>46.4</td>
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<tr>
<td>2007</td>
<td></td>
<td>39.9</td>
<td></td>
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<tr>
<td>2008</td>
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<tr>
<td>2009</td>
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The first wave was the telecommunications revolution of the 1980s, which effectively marked the start of South Korea’s digital development. During that decade the nation began manufacturing its own electronic switching systems (TDX), acquired the capacity to make DRAM semiconductors that were competitive in the global marketplace, and completed its first modern digital Public Switched Network in 1987. Teledensity increased from 7 in 1980 to almost 31 in 1990, the fastest rate of increase of any comparable country in the world.11 As the chart indicates, teledensity was still increasing as of 1990, but peaked around the turn of the century and began decreasing. The second and third waves of innovation, respectively, were broadband and mobile telephony, both of which took off following the Asian financial crisis of 1997-98. The fourth wave of innovation, not shown in the above chart, is the current drive to encourage convergence and make South Korea the world’s first “ubiquitous networked society.”

Conceptualizing the information revolution as waves of innovation has the advantage that the successive diffusion of communication innovations can be clearly measured and charted, using publicly available and widely accepted measures. Another, equally important advantage is that it allows us, throughout the book, to place the advances in Korean telecommunications in context relative to other countries around the world.

The digitization of communication technologies is largely responsible for media convergence, as the internet, broadcasting and the print media all converge to be delivered through a single digital channel. However convergence is also a much broader and multilayered phenomenon involving all major industries and technologies. Some examples of the convergence of ICT with other technologies include, robotics, nanotechnology, biotechnology, health care, the space industry, genomics and all forms of green technology, including Green IT. In any of these and other emerging technology sectors, South Korea today has the confidence that it can compete well enough to build future growth engines.12

**International Pressure for Market Liberalization**

The second major development shaping Korea’s approach to ICT strategy was mounting pressure from the United States, multinational companies and eventually the World Trade Organization (WTO) to liberalize its equipment and service markets. Market liberalization, a major theme of academic literature on

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telecommunications policy, implies privatization, government deregulation and the introduction of free market competition.

The Korean government had pursued export-led development beginning as early as the 1960s. If anything, the importance of exports increased under the so-called “developmental state” of President Park Chung Hee in the 1970s. Even today, South Korea stands out among the OECD economies for its rather heavy dependence upon the export of manufactured goods for economic growth.

The growth of Korean exports over the past three decades rather inexorably increased the salience of the international trade talks, beginning with the U.S. bilateral negotiations. Accordingly, we will note the influence of international trade negotiations at certain key points on the strategic restructuring of South Korea’s ICT sector.

**Political and Social Change in Korea**

Of course, circumstances within South Korea also shaped its approach to digital development. Many around the world remember 1980 as the year that representatives of IBM first met with Bill Gates about writing an operating system for their new, soon to be released, personal computer. For Korea, it is remembered as a politically tumultuous year. Following the assassination of President Park, Chung Hee in October 1979, there was a long period of political unrest.

Accompanying Korea’s political turmoil of 1980, but less well known around the world, were enormous social problems, including a large backlog in provision of basic telephone service. The country was then entirely dependent upon imported technology to upgrade its national telephone network. Even color television, then being enjoyed by citizens in more than 100 nations, was unavailable to South Koreans in 1980.

**“Scratches on our Minds”: Misperceptions of Korea**

The context for this book also includes international perceptions of Korea. Although South Korea has begun to make its presence felt on the international stage, misperceptions and even misunderstanding of the telecommunications revolution in this country persist. There are several reasons for this situation.

The first reason for continuing misperceptions of Korea is the reality of national division, along with North Korea’s missile tests and development of nuclear weapons. This story line routinely captures a large portion of mainstream media attention, even in the internet era where blogs and social media join The New York Times, CNN, BBC and other online sources. Because the Korean War started the long Cold War and was only ended by an armistice and not a peace treaty, South Korea has a unique status. The DMZ which crosses the Korean peninsula at the 38th parallel exists not only as a military demarcation line, but

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also as the world’s single largest digital divide. It divides the world’s most highly
networked nation, South Korea, from North Korea which Reporters without
Borders ranks as the world’s biggest “internet black hole.”

Although other topics, such as the nation’s broadband internet penetration and
usage, have begun to receive more attention in the international media, in-depth
knowledge and understanding of South Korea’s situation remains in short supply.

A second factor in misperceptions of Korea is that many of the published studies
of Korea’s experience with broadband or mobile communications fail to
adequately emphasize the historical origins of these developments in the 1980s.
Our account seeks to remedy this by presenting the crucial digital technology
developments of the 1980s and associated policies as essential precursors of
later progress.

A third element that contributes to lack of understanding is the sheer difficulty of
penetrating Korea’s language and culture. On occasion, even some of the best
accounts by international organizations or industry may misinterpret or wrongly
emphasize cultural aspects of the Korean experience. Language and culture
play a dual role in relation to Korea’s emerging information society. On the one
hand they pose a challenge for rigorous, scientific analysis of how Korea’s ICT
development actually took place. At the same time, they exert a powerful
shaping and sometimes limiting influence on the development of Korea’s unique
and dynamic information culture.

Finally, there is an interesting anomaly that underscores contemporary
vagueness about Korea. Although people around the world now use products
manufactured by Samsung and LG electronics, in many parts of the world, relatively few are aware that they are Korean companies. This fact is supported
by both survey research and anecdotal evidence. Until recently, the Korean
government and its large chaebol companies, devoted little attention in their
promotional efforts to identifying Samsung, LG, Hyundai and other leading
companies as Korean. It was only in 2009 that the Korean government launched
a nation-branding effort under the Presidential Council on National Branding.

Korea’s Ascent to the Vanguard

In the space of only three decades, South Korea transformed itself from a
developing country into one of the world’s advanced economies. There are at
least three important aspects of this remarkable economic transformation.

First is the sheer speed with which the nation achieved industrialization. From an
economy with 36.9 percent of GDP in agriculture and exports consisting of
primary goods (45.4%) and light manufactures (45.4%) in 1962, Korea became

14 www.rsf.org
15 Lee, Yong-sung, “Strong National Brand Can Help Weather Crisis,” The Korea Herald, July 24,
an economy with only 4% of GDP in agriculture and over 80 percent of exports in heavy and chemical manufactures, including electronics by 2002.

Second, unlike many advanced countries, the importance of manufacturing in Korea has continued to increase in recent years, accounting for 30% of GDP in 2006, up from 22% in 1998. At the same time the share of services decreased slightly from 51.3% in 1997 to 48.9% in 2006. Moreover, around two-thirds of the employment in Korea’s economy is in services, suggesting that Korean manufacturing firms have reduced employment to increase productivity in response to fierce international competition. The services sector has absorbed those who left the manufacturing sector, as was very evident during the IMF crisis of 1997-98. However, the effect of the decline in manufacturing jobs on the labor market is undeniable, as many university graduates cannot find jobs.16

A third important aspect of Korea’s economic growth is the radical transformation from a catch-up economy to an increasingly innovative, knowledge-based economy.17 Our interpretation is that this change was made possible by two major factors, education and ICT. While education was a necessary prerequisite for South Korea’s transformation, it was only by tapping the power of the ICT revolution that the so-called “miracle on the Han” could come to fruition. Many argue that globalization, seen as the closer and broader integration of markets, is at the core of the economic and social transformation of the last three decades. Our view, shared by others,18 is that the revolution in ICT is a fundamental driver of globalization as well as many social and economic changes.

As shown in Figure 1.2, South Korea rose from a per-capita gross national income of just $79 in 1960 to a per-capita GNI of over $21,000 in 2008. In December of 1996, Korea joined the Organization for Economic Cooperation and Development, an organization including thirty of the world’s most advanced economies. FIGURE 1.2 NEAR HERE In 2008 such organizations as the FTSE Group in London and Dow Jones publicly promoted South Korea to “developed market” status in their rankings.19

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The curve representing growth in South Korea’s GNI per capita is remarkable in several ways. First, it shows graphically that the country’s level of development began a small takeoff in the late 1970s under Park Chung Hee’s program to emphasize the heavy and chemical industries (HCI) However, the growth in GNI per capita had only reached about $2,000 by 1980 and then leveled off. Second, there is a major inflection point in 1987-88 where the economy takes off for a sustained decade of rapid economic growth. Third, following the IMF crisis in 1997-98 there is a rapid recovery and another decade of sustained growth. Developments in the ICT industry were main factors in both of those periods of growth, as well as South Korea’s ability to survive the world economic turmoil of 2008-2009. The worldwide ICT boom right after the turn of the century proved advantageous for Korea, and export growth was an especially important factor. Finally, although foreign aid played an important role in the decades immediately following the Korean War, providing for basic necessities, the bulk of such assistance had been received before the digital revolution arrived in the 1980s. By the time of the 1988 Seoul Olympics, direct aid from the United States had virtually stopped, and only small amounts of other bilateral or multilateral aid remained. Therefore, while foreign aid should be acknowledged as one factor in Korea’s emergence as a developed nation, it is not the major explanatory factor.

There are several forms of empirical evidence to support the argument that the increases in South Korea’s GNI per capita shown in Figure 1.2 are due in large part to the information revolution. First, there is an accumulating body of quantitative data over time and across many nations that shows a strong correlation between ICT development and national income. As the latest ITU report on Measuring the Information Society puts it, the link between ICT development and income has been well established and most of the indicators included in the ICT Development Index (IDI) are strongly correlated with GDP per capita. Plotting the IDI against Gross National Income (GNI) per capita (PPP$) shows a strong relationship between the two.

**The Strength of South Korea’s ICT Sector**

One can also support the argument for information-based or digital development by examining the nation’s communications infrastructure. South Korea embarked on an ambitious plan to build information superhighways in 1995 and by the turn of the century it began attracting international acclaim for having the highest broadband internet penetration in the world. Over 95 percent of the

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households in this nation subscribe to high-speed broadband internet service, a world-leading percentage. Korea has introduced Internet Protocol Television (IPTV) service and use of mobile phones in South Korea is universal. As this book will show in some detail, Korea began building its digital networks, both fixed and mobile, years ahead of the United States and many European countries. When U.S. Vice President Al Gore spoke at UCLA in January of 1994 about the need for America to build “information superhighways,” Korea took heed and launched its Korea Information Infrastructure project the very next year.

Yet another way to assess the impact of the ICT revolution in Korea is to examine the overall size, performance and growth of the information and communications technology market. Consider the following measures of the contribution of ICT to the South Korean economy over time.

- As recently as 1997, the ICT industry accounted for only 5.9 percent of Korea’s GDP. By 2009 that proportion had increased to 8.3 percent. These numbers reflect the growing production and export of semiconductor memory chips, flat panel displays and television sets, mobile phone handsets and various components for digital electronic devices.

- In 1997, as shown in Table 1.1, the ICT sector contributed only 11.4 percent to the nation’s GDP growth. By 2003 that percentage had risen to 40.3 percent and it remained substantial through 2009.

TABLE 1.1 NEAR HERE

23 [http://www.ibiblio.org/icky/speech2.html](http://www.ibiblio.org/icky/speech2.html)
Table 1.1  Contribution of IT to GDP Growth (Unit: Percent)

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</thead>
<tbody>
<tr>
<td>GDP growth</td>
<td>5.8</td>
<td>-5.7</td>
<td>10.7</td>
<td>8.8</td>
<td>4</td>
<td>7.2</td>
<td>4.6</td>
<td>2.8</td>
<td>4</td>
<td>5.2</td>
<td>5.1</td>
<td>2.3</td>
<td>0.2</td>
</tr>
<tr>
<td>IT growth</td>
<td>10.8</td>
<td>22.6</td>
<td>33.2</td>
<td>34.5</td>
<td>8.7</td>
<td>15.9</td>
<td>13.7</td>
<td>17.1</td>
<td>11.7</td>
<td>12.6</td>
<td>8.7</td>
<td>6.8</td>
<td>5.3</td>
</tr>
<tr>
<td>ratio of IT to GDP</td>
<td>5.9</td>
<td>7.2</td>
<td>7.9</td>
<td>8.7</td>
<td>8.1</td>
<td>8.2</td>
<td>8.3</td>
<td>8.8</td>
<td>8.6</td>
<td>8.5</td>
<td>8.2</td>
<td>8.0</td>
<td>8.3</td>
</tr>
<tr>
<td>Contribution</td>
<td>0.7</td>
<td>1.3</td>
<td>2.4</td>
<td>2.7</td>
<td>0.8</td>
<td>1.3</td>
<td>1.1</td>
<td>1.4</td>
<td>1</td>
<td>1.1</td>
<td>0.7</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Contribution ratio</td>
<td>11.4</td>
<td>-23.2</td>
<td>22.3</td>
<td>31.1</td>
<td>19</td>
<td>18</td>
<td>40.3</td>
<td>30.6</td>
<td>26.2</td>
<td>20.9</td>
<td>14.5</td>
<td>24.3</td>
<td>216.3</td>
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Source: Bank of Korea (2010)
IT investments in Korea facilitated capital accumulation. Such informatization-related investments as computers, peripherals, networking and software increased their share of overall facility investments from 24% in 1995 to 39.7% in 2001 and as of 2004 the share was about 34.5%. Significantly, the level of such investment increased nearly 10 percent year-on year from 1997 to 1998 as a direct response to the Asian economic or “IMF Crisis,” as it was known in Korea.24

From 1999 through 2006, the IT industry accounted for more than 2/3 of export growth. Notably, over the same period, the annual average employment in the IT industry grew faster than in the Korean economy as a whole.25

The main driver of rapid growth in the IT industry was the enhancement of productivity through continuous technology development. Economists use total factor productivity (TFP), or growth not accounted for by growth in inputs, to measure this. A great deal of economic research shows that during the decade of the 1990s, TFP in the IT industry ranged from 11.5 to 15.6 percent at different time intervals, compared with TFP growth in non-IT industries that ranged from -0.7 to 3.2 percent.26 The World Bank’s extensive study looked at what proportion of the nation’s economic growth could be attributed to total factor productivity or knowledge accumulation, and compared Korea with Mexico, which had a higher GDP per capita than Korea until 1985.27

FIGURE 1.3 ABOUT HERE

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24 Korea IT Industry Outlook, Korea Information Society Development Institute, p. 79.
25 2006 Korea IT Industry Outlook, Korea Information Society Development Institute, 2006 “Message from the President.”
26 Korea IT Industry Outlook, Korea Information Society Development Institute, p. 79.
Above is to be labeled Figure 1.3
Changes in production, management and organization that accompany IT investments further improve productivity throughout the economy. This growth factor is a major reason why Porat worked so hard to classify and measure a so-called “secondary information sector” in the U.S. economy. Failure to measure the impact of IT on all sectors of the economy dramatically underestimates its influence. If we consider this sort of impact on industry as a whole, not just IT industries, South Korea’s remarkable economic growth appears to be fundamentally an information and communications-driven revolution.

**Export-led Development**

The changing pattern of Korea’s exports also underscores the leading role of ICT in the nation’s transformation. Led by such well-known companies as Samsung, LG and Hyundai (Hynix) Korea became the world’s number one manufacturer and exporter of

- semiconductor memory chips,
- flat screen color displays and television sets, and
- mobile handsets.

Semiconductors receive special attention in our account of Korea’s experience because they power virtually all consumer and industrial electronic devices, including electronic switching devices, computers of all sorts, mobile phones and other devices to name just a few. South Korea’s growing technological expertise and strength in the semiconductor industry helps to explain its current global dominance in two other export categories mentioned as examples here: the display industry, and mobile handsets.

As of 2007, only China, the United States, Japan and Germany exceeded South Korea’s ICT exports and the OECD reported that South Korea was the number one net exporter of ICT Products in the world. It exported ICT products worth $97.4 billion in 2007, while importing technology goods valued at $54.1 billion. Moreover, Korea’s ICT trade surplus grew by an annual average of 10 percent from 1996 to 2007. In 1996, Korea earned $10.8 billion in ICT trade. In that year Korea’s IT exports totaled around $81 billion, placing it in fourth place among OECD countries.

Along with the leading product categories already mentioned, South Korea is also a major producer and exporter of electronic switches and components for fiber optic and mobile digital communication networks. Although less visible than the consumer items, these exports are the building blocks of today’s digital networks. One of the latest such products is WiBRO technology, known internationally as mobile WiMax, which is on the cutting edge of new and faster mobile communication networks. Finally, it is noteworthy that many of Korea’s

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small and medium size enterprises also participated by producing and shipping electronic gadgets of all sorts.

The ICT sector contributes about one third of Korea’s total exports, which is the highest proportion of any OECD country. Beyond this simple fact, the export led nature of the transformation in Korea’s industry and technology is reflected in three patterns shown in the following table. First, there was a rapid increase in the export to GDP ratio from 5% in 1962 to 33% in 1982 despite rapid GDP growth over that time period. Second, the share of manufactures to total exports also increased greatly. In 1962 54.6 percent of Korea’s exports were manufactured goods, a proportion that had increased to 97.5 percent by 2002. Third, there was a major shift in the composition of exports from light manufactures to heavy and chemical manufactures, with the latter category including all forms of digital electronic equipment.  

The OECD calculates an index of “revealed comparative advantage” to see whether, as an exporter, the ICT manufacturing industry performs better or worse than the average of its performance throughout the OECD area. In recent years, South Korea’s IT comparative advantage, measured as IT exports against the OECD’s average total export amount was 2.88, number one among the OECD nations.

Korea also had the highest share of ICT goods in total merchandise exports among OECD member countries during the eleven year period from 1996-2006. As of 2008, the ICT sector in South Korea accounted for 40% of its total exports. Korea’s ICT imports have grown strongly mainly due to imports of components/parts which comprised 70% of ICT imports in 2008.

In measuring trade in the total information and communications technology (ICT) sector the OECD and other international organizations look at the following five categories of goods.

- Computer equipment.
- Audio and video equipment.
- Electronic components.
- Telecom equipment
- Other ICT goods.

Of particular importance here is the telecommunications equipment category because it includes mobile phone handsets. In terms of total trade within the OECD, the telecommunications equipment category ranked third, behind computer equipment and electronic components. In 2006, it accounted for 19 percent of all ICT trade. However, overall trade in telecommunications...
equipment by OECD economies increased by more than 300 percent between 1996 and 2007, largely due to increased exports of mobile handsets.\textsuperscript{31} Mobile phone handsets fall under the sub-category “transmission apparatus for radio-telephony, radio telegraphy, radio broadcasting or television incorporating reception apparatus.” (HS2002: 852520). This category alone accounts for 65 percent of all telecommunication equipment exports. The large increase in the value of mobile phone handset exports is because they represent consumption goods, as opposed to products used in building network infrastructure.\textsuperscript{32}

**International Measures of ICT Development**

With the rapid growth of broadband internet around the world in the late 1990s and the early years of this century, key international organizations began to pay attention to measuring ICT development and the digital divide. These organizations included the International Telecommunications Union (ITU), the World Bank, the OECD, the World Economic Forum and others.

Korea has ranked at or near the top compared with other nations around the world according to various indices developed by the ITU and the OECD. The most recent ITU report on *Measuring the Information Society* singled out South Korea for the second year running as a country with a relatively low income level (in PPP terms) but a high ICT Development Index (IDI). It said “This illustrates how a strong and targeted policy towards ICT development, as the Korean Government has been pursuing for many years, can drive the development of the information society even in countries with relatively low income levels.”\textsuperscript{33}

The existing international measures of broadband internet tend to be of two types. The first group, as exemplified by the ITU and the OECD measures, look at population-wide broadband availability, use, capacity and price. The second, as illustrated by the World Economic Forum’s network readiness index and Leonard Waverman’s connectivity scorecard, address a broader range of concerns, with particular concern for the business use of ICT. Chapter 5 will examine all of the major measures and their differences in more detail.

**Dimensions of Korea’s Transformation**

As shown in Table 1.2, the economic transformation of Korea was very broadly based. Employment in agriculture declined dramatically, while manufacturing and service employment increased. Both exports and imports increased more than ten-fold from 1982 through 2005. Illiteracy was almost completely eliminated and the nation achieved nearly universal education through high school with over 80 percent of high school graduates proceeding to tertiary

\textsuperscript{31} *OECD Communications Outlook*, OECD 2009, pp. 314-318.

\textsuperscript{32} *OECD Communications Outlook*, OECD 2009, pp. 327.

education. The gross level of expenditure on research and development had reached about three percent of GDP by 2005.\textsuperscript{34}

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Table 1.2: Economic Structure of Korea, 1962-2005

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<tbody>
<tr>
<td>Population (millions)</td>
<td>26.5</td>
<td>33.5</td>
<td>39.3</td>
<td>43.7</td>
<td>48.1</td>
</tr>
<tr>
<td>Economically active population (%)</td>
<td>56.4</td>
<td>57.7</td>
<td>58.6</td>
<td>60.9</td>
<td>62.0</td>
</tr>
<tr>
<td>Unemployment rate (%)</td>
<td>8.2</td>
<td>4.5</td>
<td>4.4</td>
<td>2.5</td>
<td>3.7</td>
</tr>
<tr>
<td>Absolute Poverty (%)</td>
<td>48.3\textsuperscript{a}</td>
<td>23.4\textsuperscript{b}</td>
<td>9.8\textsuperscript{c}</td>
<td>7.6\textsuperscript{d}</td>
<td>6.4\textsuperscript{e}</td>
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**Macroeconomic indicators**

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<tr>
<td>GNP (US$ billions)</td>
<td>2.3</td>
<td>10.7</td>
<td>74.4</td>
<td>329.3</td>
<td>790.1</td>
</tr>
<tr>
<td>GNP per capita (US$)</td>
<td>87</td>
<td>320</td>
<td>1,893</td>
<td>7,527</td>
<td>16,413</td>
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**Industrial Structure (% of value added)**

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<tbody>
<tr>
<td>Agriculture, forestry, fishing, mining</td>
<td>63.4</td>
<td>50.5</td>
<td>32.1</td>
<td>14.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>7.5</td>
<td>14.1</td>
<td>21.9</td>
<td>26.5</td>
<td>18.6</td>
</tr>
<tr>
<td>Services</td>
<td>29.1</td>
<td>35.4</td>
<td>46.1</td>
<td>59.5</td>
<td>73.5</td>
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**Trade Structure**

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<tbody>
<tr>
<td>Export (US$ millions)</td>
<td>55</td>
<td>1,624</td>
<td>21,853</td>
<td>76,632</td>
<td>284,429</td>
</tr>
<tr>
<td>Share of capital goods exports (%)</td>
<td>4.9</td>
<td>9.8</td>
<td>25.2</td>
<td>37.5</td>
<td>43.9</td>
</tr>
<tr>
<td>Import (US$ millions)</td>
<td>422</td>
<td>2,522</td>
<td>24,251</td>
<td>81,775</td>
<td>261,238</td>
</tr>
<tr>
<td>Share of capital goods imports (%)</td>
<td>16.5</td>
<td>29.9</td>
<td>25.7</td>
<td>37.7</td>
<td>34.7</td>
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**Human Resources**

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<tr>
<td>Illiteracy Rate (%)</td>
<td>29.4</td>
<td>12.4</td>
<td>7.2</td>
<td>4.1</td>
<td>2.2</td>
</tr>
<tr>
<td>University enrollment after HS (%)</td>
<td>29.2</td>
<td>29.0</td>
<td>37.7</td>
<td>34.3</td>
<td>82.1</td>
</tr>
<tr>
<td>Number of university Graduates</td>
<td>20,452</td>
<td>29,544</td>
<td>62,688</td>
<td>178,631</td>
<td>268,833</td>
</tr>
<tr>
<td>Proportion of science &amp; engineering grads</td>
<td>34.6</td>
<td>45.7</td>
<td>46.4</td>
<td>40.9</td>
<td>39.4</td>
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**Technology Indicators**

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<tbody>
<tr>
<td>GERD as share of GDP (%)</td>
<td>0.25</td>
<td>0.29</td>
<td>0.96</td>
<td>2.03</td>
<td>2.99</td>
</tr>
<tr>
<td>Private enterprise share of GERD (%)</td>
<td>22.2</td>
<td>31.9</td>
<td>50.4</td>
<td>82.4</td>
<td>75.0</td>
</tr>
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</table>
a=1961 data; b=1970 data; c=1980 data; d=1990 data; e=2000 data
E-government

One cannot mention the lively politics of South Korea without also paying some attention to the positive impact of E-government. Korean citizens enjoy an array of world-leading e-government services and, not surprisingly, they lead the world in levels of e-commerce. A Nielsen survey early in early 2008 showed that 99 percent of Korean internet users have used it to shop online and 79 percent of users had shopped within the last month. For the United States, by comparison, the results were 94 percent overall and 54 percent within the last month.\(^{35}\)

E-government in Korea preceded and in some respects acted as a catalyst for the development of e-commerce. Government services in Korea were the first sector to actively adopt IT. In the 1980s the government digitized information into databases and promoted the Administrative Informatization Project. In the 1990s when the United States and other countries began looking into e-government, Korea initiated projects for administrative innovation and increased efficiency in each area of government. Consequently, Korea is now regarded as a top-level nation in terms of e-government.

In the United Nations e-Government Survey 2010, Korea ranked number one in the world on the e-government development index, followed by the United States, Canada, the United Kingdom and the Netherlands. The index includes various measures of national online services, telecommunications infrastructure, and human capital (education). The study was the fifth in a series begun in 2003 and has become recognized for providing a comprehensive assessment of e-government development.\(^{36}\)

Korea also ranked number one in the world over the past several years in a survey of e-government efforts around the world conducted by the Brookings Institute. That study looked at 1,667 government web sites in 198 countries around the world. To evaluate the state of digital government, the study looked at eighteen features of websites including the following: publications, databases, audio clips, video clips, foreign language access, not having ads, not having premium fees, not having user fees, disability access, having privacy policies, security policies, allowing digital signatures on transactions, an option to pay via credit cards, email contact information, areas to post comments, option for email updates, option for website personalization and PDA accessibility. The Brookings index also incorporated the number of online services executable on each site.\(^{37}\)


As the 2008 report of the Brookings Institution put it, “Few developments have had broader consequences for the public sector than the introduction of the internet and digital technology. Unlike traditional bricks and mortar agencies, digital delivery systems are non-hierarchical, non-linear, interactive and available 24 hours a day, seven days a week.” 38 For the past several years, Korea has ranked at or near the top of international rankings with respect to the introduction of e-government. These include the Brookings Institution studies and the United Nations E-government Surveys. 39 Korean citizens today know that their interactions with government, ranging from traffic tickets to taxes to health insurance, are handled in a fair and transparent manner, in no small part because of modern computer and communication networks.

Our Perspective on Communication in Korea’s Development

Scholars and policymakers around the world have studied the role of communication in development for well over half a century. This body of research has its roots in the mass media era 40 but is a continuing concern in the information age, as illustrated by the concerns voiced at the World Summit on the Information Society.

The considerable scholarly literature on the concept of the "developmental state" as introduced by Chalmers Johnson, seems quite relevant to Korea at least through the era of Park Chung Hee. 41 Korea was considered a developing country by any economic measure and its progress to that point had come under President Park, who placed great emphasis in the 1970s on the heavy and chemical industries (HCI).

By the early 1980s the limitations of the South Korean developmental state were becoming clear. Whereas the trend toward liberalization of domestic economies was gaining strength around the world, the South Korean government was deeply entrenched in an economy heavily dependent on exports. By the time Kim Young Sam assumed the presidency in early 1993, the South Korean economy was undergoing a transformation from an export-oriented newly-industrialized economy to an advanced industrial one. 42

While the developmental state concept helps to explain how Korea reached its stage of development in 1980, our story is primarily about what happened from that point onward. The introduction of modern, digital communications in the 1980s helped fuel an almost fourfold increase in Korea’s GNI per capita from $3,320 in 1987 to $12,190 in 1997. The nation also achieved democratization, and the success of Korea’s “Northern Policy” of opening up to the Soviet Union, Eastern European Countries, Vietnam and China in conjunction with the highly successful Seoul Olympics is a matter of record. Furthermore, from 1980 to the present, the size and the role played by the private sector relative to the state grew steadily. To be fair, it was in fact a military government that made the decision to liberalize the economy and unleash the power of private industry.

**The Information Society Concept**

As the title indicates, this book explores the Korean experience with building an information society. Consequently, the scholarly literature on the information society provides one point of reference throughout. This literature is important for two reasons. First, this concept and approach to understanding the information revolution, is by now well known all around the world, most especially in South Korea. It has become widely accepted in scholarly circles, as well as within government and policymaking circles. For example, the World Summit on the Information Society, organized by the United Nations and held in Geneva 2003 and Tunis 2005, involved most nations of the world. Organizations like the OECD and the Davos World Economic Forum have adopted information society framework. The European Union has a Directorate General for Information Society and the Media and a web portal devoted to the information society. Even critics of the information society notion are quick to acknowledge its heuristic value in an effort to understand some of the social changes experienced in countries around the world.43

Many of those who led South Korea’s telecommunications revolution of the 1980s, including this book’s author Dr. Oh, were inspired by the concept of the “information society.” During his seven years and seven months as Vice-Minister and Minister of Communications, he was an active and highly public advocate of the “information society” concept, in government, academic and industry circles.44

In 1987, Korea renamed its main telecommunications policy research institute the Korea Information Society Development Institute (KISDI), making it the first such institute in the world to bear that name. Today, it is no accident that another of the government’s IT-development think tanks is named the National Information Society Agency.

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44 During his time in that Ministry he wrote a highly readable book titled *The Thousand Faces of the Information Society.*
A second reason that the information society idea appealed to us for this book is that it is broad enough to encompass the range of concerns we deal with here. One scholar in the field has suggested that there are at least five different definitions of an information society.

- technological
- economic
- occupational
- spatial
- cultural

The technological approaches tend to center on innovations such as the semiconductor or computers that began to affect our societies in the late 1970s. Economic approaches chart the growth in economic worth of informational activities. Building on the work of Machlup, Porat distinguished between the primary and secondary information sectors of the U.S. economy and concluded that they accounted for almost half of the total economy. Daniel Bell and other sociologists looked at a change in the occupational structure of society, suggesting that an information society involves a preponderance of information work. The spatial approach, on the other hand, has its origins in geography. Castells argues that, in a network society, constraints of the clock and of distance have been radically relieved, to the extent that corporations and even individuals can manage their affairs effectively on a global scale. Finally, the cultural approach stems from the realization that contemporary culture is more heavily laden with information than its predecessors, largely due to the internet and associated digital media.

Although he most frequently used the term “post-industrial society” to describe this phenomenon, Daniel Bell’s work is one major point of reference for scholarly work on the information society. In the Foreword to the 1999 edition of The Coming of Post-Industrial Society he notes that “We can already see the shape of the manifold changes. The old distinctions in communication among telephone (voice) television (image), computer (data) and text (facsimile) have been broken down, physically interconnected by digital switching, and made

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compatible as a unified set of teletransmissions.”\textsuperscript{49} He clearly saw the convergence of media that was beginning to take place around the world. One of Bell’s most important tenets was that technology has no pre-ordained trajectory. Rather, it may take different forms in different cultural settings. South Korea is certainly one of the most interesting, if not most important cultural settings for the information revolution to date. This should become apparent as we explore various aspects of the Korean experience such as mobile communications, PC “bangs”\textsuperscript{50} or PC cafes, and massive multiplayer online games.

\section*{Strategic Restructuring of Telecommunications}

Although the breadth of the information society concept is needed to convey the rapid and profound changes in Korea over the past three decades, we also have a set of more specific concerns. They relate to telecommunications policy.

\begin{itemize}
  \item What policies did Korea adopt that brought about its transformation into an ICT power?
  \item What can other developing countries learn from the Korean experience?
\end{itemize}

We look at changes in Korea’s telecommunications sector over the past 30 years as a process of strategic restructuring. Wilson’s strategic restructuring model proves useful for our study both because it takes the diffusion of ICT as the dependent variable of interest, and because it focuses on the experience of developing countries. His model seeks to explain ICT diffusion through the interaction of four distinct determinants:

\begin{itemize}
  \item structures (especially social structures, but also economic and political structures),
  \item institutions (that is, persistent patterns of roles and incentives),
  \item politics (especially elite strategic behaviors) and
  \item government policies (specifically a mix of four policy balances—private and public initiative, competition and monopoly, foreign and domestic, centralized and decentralized).\textsuperscript{51}
\end{itemize}

Wilson’s model takes into account the role of leadership and vision in ICT diffusion, concerns that we share. Also, the four policy balances provide a good framework for interpreting the changes in Korea over the past three decades.


\textsuperscript{50} bang is the Korean word for room, so its internet cafes or PC cafes are commonly referred to in the Korean language as \textit{PC bangs}. We will refer to them throughout as PC cafes or internet cafes, the more common English usage.

We interpret the balance between domestic and foreign ownership broadly, to include the important influence that international trade discussions, especially with the United States and within the WTO, have had on South Korea’s telecommunications policy. The strategic restructuring framework also acknowledges the important reality that shifts in these four balances within the ICT sector are highly political, with the politics determining which societal interests will get to control the richest and most politically sensitive sector in the modern world.52

Our main research questions throughout the book cluster around four themes or sets of questions.

1. The nature of government-led telecommunications policy, including the changing nature of the government-chaebol relationship over time. This area includes consideration of the four key policy balances that are part of strategic restructuring of the ICT sector: public versus private, monopoly versus competition, foreign versus domestic and centralized versus decentralized.

2. The role of education and citizen awareness. These questions include ICT education, research and development, and public promotion and education for the information society.

3. Technology acquisition and innovation policy. This theme of our book emphasizes the manner in which Korea approached the acquisition of new technology and how it was transformed from a follower to an innovator.

4. Globalization and Korea’s role in the new, global information society. This area looks at how the nature of Korea’s large corporations and its governmental involvement in world affairs has changed, and with it provided an opportunity to work directly with many developing nations.

**The Accomplishments and Policies of the 1980s**

Our perspective on Korea’s digital development is not only shaped by theory, but also by practice and experience. The book’s first author was a prominent leader of the telecommunications sector during the 1980s. He led the shaping of major policies, the influence of which was felt through the 1990s and beyond. Those major policies and changes are as follows.53

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Reorganization of the Telecommunications Management System

The first major policy change was a fundamental and historic restructuring of the telecommunications management system. Until 1980, everything in South Korea’s telecoms sector was handled through the Ministry Communications, a government monopoly. The new framework introduced by Dr. Oh and his colleagues consisted of a policymaking arm, a business operation arm, and research and development institutes. These three areas comprised a specialized system in which each organization was assigned specific functions.

The Telecommunications Policy Office, established on January 1, 1982, was given responsibility for formulating and promoting telecommunications policies in the public interest. It supervised and supported the public telecommunications manufacturing and construction industries. In January of 1984 the Ministry restructured the Telecommunications Policy Office into four divisions responsible for Telecommunications Planning, Telecommunications Promotion, Telecommunications Management and the Information/Communications. The purpose of this reorganization was to strengthen the information and communication sectors.

The business operations in Korean telecommunications were bolstered by the establishment of the Korea Telecommunications Authority (KTA) and DACOM Corporation. KTA was established on January 1, 1982 to administer telecommunications business operations and pursue profitability based on the public interest. The government was the sole investor, contributing 2.5 trillion won to establish the Authority. At the time, a total of 35,225 employees from 153 divisions moved from the MOC to KTA, the largest reshuffling of personnel from one organization to another in the history of the Korean government. However, there were few problems during the transition and it set an example for the subsequent establishment of the Korea Tobacco Monopoly Corporation.

In an effort to boost the sagging data communications sector, the MOC decided that a private company needed to administer business operations in that field. Consequently, on March 29, 1982 it established the Data Communications Corporation of Korea (DACOM) under a business promotion committee on which this book’s author served as a commissioner, as Vice-Minister of Communication. In April of the same year, the first value-added telecommunications service was licensed to provide public data transmission, processing and databank services. In 1984, the Korea Mobile Telecommunications Corporation was established to oversee mobile and paging services. A year later, the Korea Port Telecommunications Corporation was formed to handle wired and wireless services relating to Korea’s ports.

The formation of research and development institutes for the telecommunications sector also began during the 1980s. On March 26, 1985 the Telecommunications Research Institute of Korea was merged with the Electronics and Telecommunications Research Institute (ETRI). In February of the same year, the Institute for Communications Research (ICR) was established
as a think tank for policymaking. In January of 1988 it was re-named the Korea Information Society Development Institute (KISDI).

Resolution of the Telephone Backlog and Nationwide Telephone Automation

A backlog in fulfilling requests for telephone service, as described in more detail below, was one of the most serious problems affecting Korean society during the 1970s. However, starting in 1981 the government installed an additional one million lines and made an average annual investment of one trillion won. As a result, the number of telephone lines exceeded 10 million as of October 1987, making Korea tenth in the world in terms of the number of lines installed. This made it possible for every Korean household to be equipped with a telephone.

In 1984 Korea became the first nation in the world to complete construction of a digital toll switching network. By 1987 the chronic telephone service backlog had been completely eliminated by introducing an immediate installation system.

The year 1987 was also significant for completion of the nationwide telephone automation system. By June of 1987 Korea had an automated long-distance calling service, promotion of subscription in rural areas, and automated telephone service on islands. Taken together these projects meant realization of the goal of a nationwide automated calling system. They allowed callers to receive direct international call service to 100 countries worldwide as well as immediate local and toll-call services. Service was provided to a total of 25,000 villages, each with at least 10 households, in mountainous areas and to 500 island villages as well.

Development of the TDX Electronic Switching System

In retrospect, the domestic development of the TDX Electronic Switching System is regarded as the most outstanding achievement in Korea’s telecommunications sector over the years. Even Daniel Bell expressed his astonishment at Korea’s early development of an electronic switching system.

By the end of the 1970s, it was apparent that the existing mechanical and space division switching systems were insufficient to resolve Korea’s chronic telephone service backlog. This pointed to an immediate need for an electronic switching system. The origins and development of TDX will be discussed in detail in Chapter 2. With the successful development of this switch, Korea became the only nation in the world to leap directly from the production of manual telephone exchanges to electronic exchanges without the intermediate experience of manufacturing mechanical or semi-electronic telephone exchanges. It became the tenth nation in the world to accomplish the proprietary development of an electronic switching system and the sixth nation to export such a system to foreign countries. The development of TDX not only triggered rapid progress in Korean information and telecommunications technology, but also substantially reduced the considerable expense associated with importing foreign-made equipment.
Deregulating the Supply of Terminals

Until the 1970s the Ministry of Communications itself was the only supplier of household telephone terminals as well as the only lender of telephone sets. This meant that subscribers did not have the option of owning a telephone or choosing which model of telephone they received. However, in January of 1981 the MOC introduced a policy that gave subscribers the opportunity to choose from a variety of options. On September 1, 1985, the MOC transferred the ownership of 2.27 million telephone sets from the KTA to telephone subscribers themselves. Consequently, manufacturers began to produce telephone sets with diverse functions and various designs, giving buyers a wider range of choices. At the same time, terminals for mobile telephones and telex machines were made available to the public, and complete liberalization of terminal distribution became a reality.

Deregulation of the Public Switched Telephone Network (PSTN) and Radio Wave Use

In keeping with worldwide trends in digital communications, facsimile machines, modems and personal computers began to find their way into offices and homes throughout Korea during the early 1980s. Prior to 1982 these devices could not be connected to the PSTN. Instead, they were connected to lines specifically designated for such devices. However, in March of 1983 the PSTN became available to the public and provided non-voice telecommunication services for facsimiles, modems and computers. It is worthwhile to note that this move preceded such deregulation of the PSTN in most European countries.

Until the 1970s private use of radio-wave frequencies had been restricted for national security reasons. In December of 1982 the MOC introduced paging service and a little later mobile communications service, initially only in metropolitan areas. The use of cordless phones was permitted beginning in September of 1983. Also, integrated management of broadcasting networks was introduced at the end of 1986, improving their operation and increasing the service coverage rate from 66% in 1980 to 94% in 1987.

In addition to the above policies, there were two other related issues dealt with by the Korean government during the 1980s. They were the introduction of color television broadcasting and the securing of financial resources for investment in telecommunications.

The first television broadcast in Korea took place on June 1, 1956. It was not until October 1980 that, despite fierce opposition, the government decided to start color television broadcasting. The first color telecast took place on December 1 of that year. This was 29 years behind the United States and 20 years behind Japan.

The development of Korea’s telecommunications sector required a tremendous investment. During the formulation of basic plans for telecommunications development in the early 1980s two measures were taken to guarantee a stable
investment in telecommunications infrastructure. First, the 1981 revision of the Law on the Expansion of Information Facilities, first enacted in 1979, encouraged subscribers to purchase a fixed number of telephone bonds at the time of telephone installation. In Seoul, this cost a new subscriber 200,000 won. Second, the relatively low telephone charges at the time were adjusted to a more reasonable level. The local call rate increased from 8 won to 12 won in January 1980. It rose to 15 won in June 1981 and to 20 won in December of the same year. During the severely inflationary environment of the times, this measure was thought necessary to secure telecommunications funding.

Some Precursors of Korea’s 1980s Telecommunications Revolution

Our narrative largely begins in the year 1980, with the events described in the following chapter. However, before getting to that, it is important to provide some historical context. The first part of the following section touches on several important historical innovations in Korean communications. Although they precede this account by centuries, they are directly relevant to our present concerns, especially in the case of the Han-gul alphabet. Finally, to set the stage for Chapter two, we describe the rather miserable state of affairs that characterized South Korean telecommunications and its electronics sector through the decade of the 70s right up until 1980.

Pre-Twentieth Century Developments

In the long sweep of Korean history there have been several important innovations in communication. One of these important developments was the earliest recorded use of moveable metal type in the history of the world. It is not yet widely understood or taught in the West that this occurred in Korea long before Gutenberg's breakthrough in Germany. Printing by moveable type is said to have been invented by Pi Sheng of the Northern Sung dynasty, who used clay type, a practice which was not widely imitated. During the Koryo dynasty in Korea there is a record of the use of cast metal type for the printing of a book in the year 1234, and it likely was not many years earlier that Koryo began to print with such type. Toward the end of the Koryo dynasty in 1392 a National Office for Book Publication was established and charged with casting of type and printing of books, thus laying the foundation for moveable type printing to flourish during the Yi dynasty. Type was cast in great quantities and widely used in book publication.54

While the use of moveable metal type was undoubtedly an important innovation, the printing of books was initially done in Chinese characters. This situation continued until 1446 when King Sejong, in his 28th year on the throne, promulgated Han-gul. Han-gul literally means “the Korean writing.” The creation

of Han-gul, an indigenous alphabet for the Korean people ranks as one of the crowning cultural achievements of the Korean people. The king's concern that his people have a writing system designed to express the language of their everyday speech, along with a concern that his subjects be able to readily learn and use it were two primary motivations for its development.\(^{55}\)

In the introduction to his proclamation, King Sejong wrote in part, “. . . I have designed 28 letters that everyone may learn with ease and use with convenience for his daily life. Talented persons will learn Han-gul in a single morning and even foolish persons will understand it in ten days.”\(^ {56}\)

Historically, the introduction of Chinese characters to Korea posed several difficulties, since they constituted a foreign written language. One was that most Koreans could not understand the meaning of texts written in Chinese characters, especially their allusions and metaphors. Therefore, Shilla Kingdom (57 B.C.-935) developed a system for using Chinese characters in which a Korean word was represented either by a Chinese character having its sound, or by one sharing its meaning. The system, called idu, proved to be inadequate for everyday communication.\(^ {57}\)

Lacking an alphabet, the people's access to written materials would be limited to the educated elites, those whose circumstances would permit them to master several thousand or more Chinese characters. Today the vocabulary of the Korean language is made up of about 40 percent indigenous words and 60 percent loan words, the vast majority of which are Chinese.

The Han-gul alphabet has twenty-eight characters and is nearly perfectly phonetic, so recognition and pronunciation can be taught and learned in a matter of hours. For our purposes in this book, several aspects of the Han-gul alphabet are noteworthy.

- Together with improved printing techniques, it contributed to a strong tradition of mass literacy in Korea. In particular it facilitated the drive toward near-universal literacy in the years following the Korean war.
- It spurred the rapid diffusion of computers, mobile phones and other devices requiring keyboard input, accelerating South Korea’s uptake of the new information technologies.
- It contributed to a revolution in the graphics used in outdoor signs and all print, broadcast and electronic media because its alphabetic character lends itself perfectly to an endless variety of fonts. Today, the creation and sale of new Han-gul fonts for use on internet home pages is a major activity. For example, users of Cyworld, South Korea’s major social


\(^{57}\) Lee, Ki-baik. *A New History of Korea*, p. 57.
networking portal, say that pretty new fonts enable them to express themselves more freely in their writing.

We underscore this background because the mainstream press and even more specialized research tend to gloss over or obscure the real impact of the *Han-gul* alphabet. For example, a recent article by *The Economist* dealt with the ease or difficulty of typing text messages on mobile phones in different languages, with attention to the Latin alphabet, Chinese, Japanese, and even Tamil, but no mention of *Han-gul*.\(^{58}\) Even ITU researchers, in a widely disseminated case study on broadband internet in Korea interpreted the influence of *Han-gul* wrongly. Their study contends that language was a factor weighing against Korea’s success relative to the other Asian Tigers. “Koreans have their own language. Therefore, the country cannot easily leverage the vast amount of content developed in more widely spoken languages.”\(^{59}\) To this point in their argument, the ITU research team makes a point that we also emphasize in this book. However, their report then makes an egregious error, stating that “The Korean alphabet, known as *Han-gul*, uses a pictographic font that is not ideally suited to computerization.”\(^{60}\)

In point of fact, as already noted, *Han-gul* is alphabetic and perfectly suited to computerization. Furthermore, it expedited and hastened the adoption in Korea of not only computers, but mobile handsets and any type of device that used a keyboard for input. Koreans type faster on *Han-gul* keyboards, on average, than Westerners who use English keyboards. It was no accident that, in January of 2010, a team of two young Koreans beat 24 other competitors from twelve countries in the LG Mobile Worldcup, an international contest to see who could input text fastest on a cell phone. Contestants texted in their native languages.\(^{61}\)

Another ancient innovation in Korean communication, briefly noted above, was the network of beacons using fire at night and smoke during the day, established in 1149 to relay communication from one mountain ridge to another throughout the nation. It was used to quickly inform the capital of military crises that might occur in the provinces. This system continued to be used throughout the Chosun Dynasty (1392-1910) and was improved and intensified by King Sejong. At its peak there were 670 signal beacons and the system was very efficient, precisely because of Korea’s mountainous terrain. Using pre-arranged signals, a message could be sent over a distance of about 350 miles in 4 hours.\(^{62}\)


\(^{59}\) Broadband Korea: Internet Case Study, ITU, March 2003, p. 2.

\(^{60}\) Broadband Korea: Internet Case Study, ITU, March 2003, p. 2.

\(^{61}\) http://www.lgmobileworldcup.com/index.jsp

Korean Telecommunications pre-1980

The history of modern telecommunications in Korea spans more than a century and is usually dated from the introduction of telegraph service in 1885. The telephone came to Korea in 1898, but the first automatic telephone system was not installed until 1935 under the Japanese colonial government.

During the colonial period, as early as the 1920s, Korea operated telecommunications networks including a wired line that connected Seoul and Incheon, and its first broadcasting station, the Gyeongseong Station. However, the Korean War destroyed 80 percent of Korea’s existing telephone and telegraph systems. The capital of Seoul, with a population of 2 million, had only 17,000 telephones. This shortage of telephones and the backlog in provision of phone service continued into the late 1970s when it became a full-blown social crisis, demanding the government’s attention.

Under President Park Chung Hee in the early 1960s the government recognized the importance of the electronics and IT industries and began to actively promote them. The government’s first five-year economic development plan in 1962 allowed an unlimited flow of foreign capital to support the electronics industry and opened the way for governmental support. To enhance R&D, the first national research institute, The Korea Institute for Science and Technology (KIST) was established in 1966. KIST would provide a talent pool and its division of electronics and telecommunications would later become independent as the Electronics and Telecommunications Research Institute, the “Bell Labs” of Korea. The establishment of KIST was based partly on U.S. assistance in return for sending Korean troops to Vietnam.

The 1970s Telephone Backlog Crisis

Although the number of telephones available in Seoul increased greatly in the postwar years, it came nowhere near meeting the needs of the Korean public. As the decade of the 1970s came to a close, South Korea had a population approaching 36 million people, and its industrial and commercial base was rapidly developing, yet it had fewer than 2.8 million telephone lines. More than 600,000 of these lines, approximately one-quarter of the installed capacity, remained on back order. This shortfall in telephone service created enormous social, economic and political problems.

Ironically, it was the success of Korea’s third national five year economic development plan (1972-1976) that helped increase public demand for telecommunications services, thereby increasing the backlog problem. In those days, telephone service was regulated and administered by the Ministry of Posts and Telecommunications. However, the Ministry utterly lacked the capacity to deliver such service to the majority of Korean citizens.

During the 1970s, the average citizen who applied to have telephone service installed would have to wait a year and a half for service to start. Such regular telephone service meant that a citizen would have a standard blue telephone installed by the Ministry.

A wealthy person, on the other hand, could order a white telephone, which came with automatic registration for the immediate start of service, and commanded a handsome price of U.S. $3,000 or more on the black market. That was approximately ten times the official government price for phone service. Everyone soon came to know that the difference between a blue and a white phone in Korea was no simple color difference. From a social point of view, it exacerbated class divisions and came to symbolize scandalous behavior. At that time one of those white telephones would cost as much as a house! The newspaper society pages were filled with stories of telephone theft. They told of thieves breaking into the homes of wealthy families and stealing the white telephone sets. Under the provisional government put in place after the assassination of President Park Chung Hee, the illicit traffic in stolen white telephones flourished shamelessly. Such practices contributed to corruption as there was a stampede of high ranking people requesting favors of the Ministry of Communications. Many of these powerful people put strong pressure on the telephone office staff, offering them extra money if they could register for service.

As late as 1980, a kindergarten or grade school teacher in South Korea could easily find out which students came from well to do families simply by asking those who had a telephone in their home to raise their hands. However, it would all start to change that year. In the next two chapters, we explain how Korea’s leadership came to grips with the telephone backlog crisis, overcame the sense of malaise in the electronics sector as of 1980, and developed a long term plan to revitalize that important sector.

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Chapter 2: On the Shoulders of Giants: The 1980s Telecommunications Revolution in Korea

While the 1970s ended with political crisis and malaise in South Korea’s ICT sector, the 1980s were an epochal decade. The revolutionary character of the changes that took place in that decade and their relationship to today’s developments are still not adequately acknowledged and understood outside of South Korea and by many younger Koreans. Our focus in this chapter is on the giant strides taken in the 1980s that laid the foundation for subsequent digital development in Korea.

We begin by sketching the situation that existed in Korea in 1980, as the new decade dawned. The second section of the chapter traces the government’s response to this situation. The next three parts of the chapter go into some depth in describing the TDX electronic switching project, the 4MB DRAM semiconductor project and the controversial decision to begin color television broadcasting. The sixth section shows how Korea began to privatize telecommunications services. Finally, we conclude with some comments on the legacy of the 1980s telecommunications revolution in Korea.

The Starting Point: South Korea in 1980

South Korea in 1980 was in a rather desperate situation, in terms of the structures, institutions, politics and government policies that shape the information and communication technology (ICT) sector. All of these would undergo dramatic change during the decade and they serve as useful reference points as we trace the path of the digital information revolution in South Korea.

Structures

South Korea’s political, social and economic structures were all under extreme stress in early 1980. Politically, there was turmoil following the October 1979 assassination of President Park Chung Hee that continued into 1980 and under the government of President Chun Doo Hwan. Although the Chun government was criticized in many areas, its accomplishments in building new, and modern digital communications networks would eventually help to usher in a lively participatory democracy in South Korea.

As described in Chapter 1, the decade also began with a major social problem in the form of a massive backlog in provision of telephone service. In today’s terms,

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this would be called a “digital divide,” but it occurred near the end of the analogue era and digital switching was to be part of the solution. To prevent further exacerbation of the divide, Korea would need to provide nationwide telephone service, closing the gap that existed between wealthy and poor, rural and urban as of 1980.

The South Korean economy faced a severe crisis in 1980. On top of the political turmoil, an unusually cold, damp summer led to a disastrous harvest that year and agricultural production dropped by no less than 22 percent. The Korean economy suffered negative growth for the first time in two decades, contracting by 5.2 percent, while inflation soared to 29 percent in consumer prices and 39 percent in wholesale prices. The nation’s current account deficit ballooned to over $5.3 billion, and the entire electronics sector of the economy was in a state of growing malaise.

Internationally, South Korea remained separated from China, the Soviet Union, Eastern European nations and Vietnam by the long cold war. Thirty years later, all of these nations would be major export destinations for South Korea’s ICT products, as we shall detail in Chapter 9.

**Institutions**

Institutionally, the South Korean government in early 1980 was in a period of transition. The government of President Chun Doo Hwan, like that of President Park Chung Hee before him, featured a strong centralized bureaucracy with many well-educated and talented civil servants.

Political power in South Korea flowed from the Blue House (*Chong Wa Dae*). Within *Chong Wa Dae*, the Economic Secretary to the President was one of the most powerful positions in government. Among the cabinet ministries, the Economic Planning Board was extremely powerful. It was there that the Stanford-trained Economist, Kim Jae-Ik served before being summoned to work in the Blue House as Economic Advisor to the President.

In the telecommunications sector, all policymaking, regulation and provision of services was handled by the Ministry of Posts and Telecommunication as a government monopoly. This was a relatively weak Ministry and as noted in Chapter 1, the Minister of Communications had traditionally been a political appointee. There was no private telecommunications business to speak of. Even telephone handsets had to be purchased through the Ministry, leading to the black market in “white” telephones as described earlier.

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**Politics**

The politics of South Korea’s elites in the electronics and telecommunications sectors were nearly as tumultuous as national politics and formation of a new government. For example, there was a protracted and strong political battle to get approval to begin color television broadcasting. For political reasons, color television broadcasting was not yet allowed in South Korea, even though more than 100 other nations already used it. Progress toward manufacturing Korea’s own electronic switches was also stymied, partly for political reasons.

The changes that began in 1980 and produced epochal change by the decade’s end all involved political battles and debates. This chapter will outline those political struggles behind such key projects such as the TDX switching system, and the 4 MB DRAM semiconductor. One of the most controversial decisions would be to open up the Public Switched Telephone Network for public use upon its completion in 1987.

**Policies**

In early 1980 telecommunications in Korea was still a government monopoly. The public-private balance was strongly on the public side as everything was handled through a government ministry. In terms of the domestic-foreign balance in policy, the impact of bilateral trade talks with the United States and the WTO agreement would come years later. At the start of the decade, Korea was mainly worried about nurturing its own domestic market so that it might survive and compete in a world market that was experiencing the transition to digital communications.

In this chapter, we begin the story of how the nation approached the introduction of competition into the telecoms market. We will also look at the degree to which telecommunications policy in South Korea was centralized versus distributed among different government and private sector organizations. Of particular interest here is the shifting locus of power among government ministries. In 1980 the Ministry of Posts and Telecommunications was not a powerhouse. A decade and a half later it had become one of the two or three most powerful ministries.

Each and every one of these circumstances—structures, institutions, politics and policies—would change dramatically by the end of the decade, in no small part because of key technology and policy decisions emanating from top levels of leadership in Korea’s presidential mansion, the Blue House, and in the Ministry of Communications. The leaders drafted a long-term plan to revitalize South Korea’s electronics sector. However, success required not only government leadership, but the full cooperation of industry and ultimately many individuals. Elements of the overall plan were difficult, fraught with trial and error, met with skepticism by critics, and politically opposed. We turn next to the Korean government’s response to the desperate situation it faced in 1980.
The Government Response

The key policy decisions that set South Korea on its path of rapid digital development all emanated from the Blue House, and a set of rather remarkable events, beginning in August of 1980. The following is a first-person account of those events from the perspective of one of the authors, who was a participant.

Decision-Making in the Blue House

During August of 1980 leaders from the Military Academy, members of the Cabinet, and government department heads were summoned to an emergency meeting of the Special Committee for National Security in Samcheong Dong.\(^{71}\) The meeting was held in a cafeteria that would later become the offices of the Special Committee. At that meeting a sub-committee was formed on which this book’s author was asked to serve. His first responsibility as a member of this sub-committee was to provide a plan and suggest directions to help revitalize the nation’s electronics industry.

About two months later the author received an invitation to have dinner with Dr. Kim, Jae Ik the highly respected Stanford trained Chief Economic Secretary to the President.\(^ {72}\) Coincidentally, both men had attended Kyunggi High School, with Kim, Jae Ik preceding the author by one year. Consequently, their relationship began on a friendly basis and with a sense of closeness.

The two men met for dinner at a Korean restaurant in Kwanghwamun, near the center of Seoul. The conversation naturally flowed around Korean science and technology, with a specific focus on computers, semiconductors and the need for Korea to introduce electronic switching systems to modernize its telecommunications system. They touched on the need to begin color television broadcasting and the difficult situation Korea faced in the electronics market because it was slow to make the transition from an agricultural to an industrial society. They agreed that with the future merging of computers and telecommunications in the information society Korea would experience yet another transformation. If it was late in making this one, it seemed that Korea would remain perpetually a developing country.

Near the end of this long dinner meeting, which ran until curfew time, Kim, Jae Ik invited the author to come to the Blue House and work with him as a Secretary to the President for Science and Technology. The invitation was accepted without hesitation and the two men worked closely together in the Blue House for the

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\(^{71}\) Oh, Myung. *History of the 1980s Telecommunications Revolution*, unpublished Korean-language manuscript, p. 73.

\(^{72}\) Kim Jae Ik was a Stanford trained Ph.D. who was widely regarded to be one of Korea’s most gifted economists and a highly influential policymaker, until his tragic death in the Burma bombing of 1983. The story of this dinner meeting has been told and re-told countless times by leaders in South Korea’s telecommunications sector.
next eight months. During that period they pushed forward with color TV broadcasting, the privatization of KT, and the establishment of DACOM. One of the most important outcomes of their work together was the Long Term Plan to Revitalize the Electronics Sector.

**The Long Term Plan to Revitalize the Electronics Sector**

The long term strategy to foster Korea’s electronics industry was coordinated by the Blue House and drafted with the help of academic specialists and government experts from numerous agencies. The working group that wrote the plan represented all the bodies and agencies with a stake in the future direction of the electronics industry. There were representatives from five ministries (The Ministry of Trade and Industry, the Economic Planning Board, Ministry of Communications, Ministry of Finance, and Ministry of Science and Technology); four companies (Samsung, Goldstar, Anam and Sanhwa Condenser); and two research institutes (KIET and KETRI-which were consolidated in 1985 to form the Electronics and Telecommunications Research Institute, ETRI).

The long term plan focused on the development of three strategic industries – semiconductors, computers and electronic switching systems. It called for the electronics sector of Korea’s economy to more than double in size over a five-year period.

In the semiconductor field, the plan favored wafer fabrication over “back end” test and assembly, and identified mass production of memory chips for export, rather than meeting domestic demand, as the most viable strategy. The plan was based on the large and growing world market for semiconductors and the fact that they were standardized. Two crucial assumptions were that chip designs could be licensed and the fabrication technology could be bought on the open market, mainly from Japanese and U.S. firms.

The significance of the 1981 Long Term Plan for South Korea is difficult to overestimate, based on two of its characteristics. First, it addressed the entire electronics sector, acknowledging that it was all being shaped by innovations in digital technology. More specifically, electronic switching in the telecommunications sector had a great deal in common with the semiconductor industry. Hence, Korea could not have success in one without the other. Second, the long term plan addressed the question of how revitalization of the electronics sector would be financed. There were two important aspects of the whole question as to how the transition in Korea’s electronics sector would be financed.

One was that the plan for development of the semiconductor industry (1982-86) put pressure on the chaebol to make serious commitments. It called for public investment of $400 million, of which 40 percent would financed by the National Investment Fund and the remainder by the Electronics Industry Promotion Fund, which had not yet been created. It envisaged a level of promotion ten times larger than anything attempted up to then and represented a new style of
government intervention. The heavy-handed HCI (Heavy and Chemical Industrialization) phase was wound back and promotion of the semiconductor industry became part of a new emphasis on coordination by public agencies of Korea’s transition to a knowledge-intensive economy.\(^{73}\)

A second factor that helped solve the financial challenge was the manner in which the government reorganized the public sector telecommunications system. With the start of privatization, such companies as Samsung, Goldstar and Daewoo were allocated profitable segments of telecoms sector in which to build up specialized businesses and were introduced to such foreign companies as ITT, AT&T and Nortel. The profits from the telecoms activities of these Korean companies provided a secure cash flow while they were making a huge investment in semiconductor fabrication.

There were many, including government officials, who opposed the long term plan and even scoffed at it. They argued that the electronics industry was not a good investment because its hallmark of rapid technological change would make it difficult for Korea to catch up. Many argued that Korea should concentrate instead on strengthening labor-intensive industries. Despite such criticisms, the “Long-Term Policy” was implemented and within five years the electronics industry had become the leading industry in Korea.

**Installing a Technocrat at the Ministry of Communications**

Even with the Blue House mandate provided by the 1981 long range plan, implementation of the new policies would require the involvement of the Ministry of Communications. The problem was that, by tradition, the Minister of Communications was a political appointee, chosen without regard for technical background or expertise with the new electronic and digital communication.

Fortunately Choi Kwang Soo then-Minister of Communications proposed to President Chun that this book’s author move to the Ministry emphasizing that since it “...deals with technical matters it would be good if the Vice-Minister is a person who knows and thoroughly understands the technology and its significance.” The President accepted his recommendation. It was also supported by Kim Jae-Ik, who told the author that he should “Go and do the work that is needed! Truly, if we want to invigorate the electronics industry you must go to the Ministry of Communications. The core of the electronics industry is telecommunications. ... The (Blue House) Secretariat, while overseeing these matters, will not only work smoothly, but will have a competent person in charge as Vice-Minister directly under it. Maybe it (the electronics sector) can fly like a bird.” So, although this book’s author was leaving the Blue House, he would continue to work very closely with it in a new relationship that would continue

throughout his seven years and seven months as Vice-Minister and Minister of Communications.

The appointment of a Vice-Minister with professional training directly relevant to the ongoing revolution in digital communication set a precedent that would be followed for more than a quarter century. It signaled recognition by the Korean government of the need to make wise, informed, long-term policy decisions during a period of rapid technological change in the ICT sector.

**Four Key Choices**

As reviewed in Chapter 1, this book’s author helped shape a number of policies that together propelled Korea’s telecommunications revolution of the 1980s. Four of those policies led directly to some of the nation’s leading export industries today. Korea’s leadership decided to

- Develop and manufacture electronic switching systems (TDX).
- Enter the global semiconductor industry, with an emphasis on DRAM chips.
- Begin color television broadcasting.
- Separate the telecommunications business from the government ministry, including the formation of KTA (the Korea Telecommunications Authority), predecessor of KT (Korea Telecom). This move for the first time allowed the commercial sale of telephone sets, and marked the start of privatization of telecommunications.

Looking back at these decisions from today’s perspective, nearly three decades later, they seem remarkably farsighted. Each decision anchors one part of South Korea’s strong export-led economic development. The nation is now a major manufacturer and exporter in each of the four industries affected by the policy decisions: advanced networks, semiconductor memory chips, flat screen color television sets and displays and mobile handsets.

These four industries and their underlying technologies undergird the emerging global information society in several crucial ways. First, they are technically closely interrelated and synergistic. Switches are essentially the computers that make today’s digital networks possible, as epitomized by the internet and cloud computing. Semiconductors are, of course, an essential component in computers and a host of other electronic devices, including switches, television sets, mobile phones. Second, the mobility revolution, sometimes referred to as “Cutting the Cord” is a pervasive development with profound consequences for how all of us communicate and use the internet, today and tomorrow. Finally, the contemporary advances in color displays appeal to the all-important human sense of sight, and promise within this century to allow the more pervasive
communication of visual images, perhaps in three dimensions, along with text, graphics and other data. As displays become more ubiquitous, so does television, which remains an immensely popular medium around the world.

“A Telephone in Every Household”—Building the PSTN

The telecommunications policy adopted by Korea in 1980 stated the goal of universal service from the very beginning. At the time the policy goals were stated, the nation had an old and completely inadequate telephone system that favored the wealthy and privileged who could find ways to get around the reality of the telephone service backlog. The new policy stated in the early 1980s called for building an “information welfare society,”74 in which all Koreans, rural and urban, rich and poor would receive the same level of telecommunications service. Even more specifically, the government stated the policy goal of moving quickly toward a single, fixed toll for telephone service nationwide. As of 1980, there were differential tolls to different parts of the country, based on distance. Beyond a 100 kilometer radius the toll would increase. So, for example, it was much more expensive to place a call from Seoul to the island province of Jeju than to a nearby province. Korean policymakers in the early 1980s even discussed the goal of moving toward a single toll for voice telephone service worldwide, making it one of the first countries in which such a long range prospect was considered. Today the world appears on the verge of achieving that goal, with the widespread adoption of mobile broadband and VOIP services.

The policy goal of creating an information welfare society meant that, from the start, there would be no shared use rural “party lines,” such as those used in the United States in the mid twentieth century. The early adoption of this goal also helps to explain why the lively net neutrality debate in the United States and Europe has not gained much traction in South Korea.

Work toward implementation of the new policy began with construction of the nation’s first genuinely digital network, with a fiber optic backbone and digital switches. The PSTN (Public Switched Telephone Network) was completed in June of 1987. Completion of this network not only eliminated the telephone backlog in Korea, but allowed callers to receive direct international call service to 100 countries worldwide, as well as immediate local and toll call services. The MOC provided such service to a total of 25,000 villages, each with at least 10 households, in mountainous areas and in 500 island villages as well.75 Completion of the PSTN in 1987 was publicly acclaimed in South Korea as ushering in the era of “one telephone per household.” While not widely

74 In Korean, 정보복지사회 or information welfare society.

recognized outside of Korea also gave the nation one of the most modern telephone networks in the world, surpassing such nations as Japan whose network at that time still included a large number of older crossbar switches.

By focusing its efforts on building the PSTN, South Korea was acknowledging the importance of networks in the information age and setting the stage for future generations of digital networks. As Noam put it, “In the information economy, information highways are fundamental and benefit everyone. The multipliers are large for the information sector directly and for the economy as a whole indirectly.”76 We turn next to a crucial element in construction of the PSTN, the successful development of the TDX electronic switching system.

The Switch is On: Korea’s Successful TDX Project

Digital switching can be likened to the brain or nervous system of the internet and other modern digital networks. The switches and routers that make up digital networks provide a means of building intelligence into the network. They make possible cloud computing and are at the heart of the revolution in ICT that is transforming Korea and the world.

During the 1970s, developments in the electronic switching industry globally, along with the persistent problem of the backlog in provision of telephone service, brought electronic switching technology to the attention of policymakers and experts in Korea. The individual widely credited with introducing electronic switching technology as a national priority in Korea was Dr. Kim Jae Ik. The actual announcement was made at a social gathering in February of 1976 by the Economics Minister. That was where he first publicly revealed his decision that Korea needed to import electronic switching systems. After some discussion a team at KIST (Korea Institute of Science and Technology) was made responsible.77 In December of that year an “Electronic Switching System Development Plan” was drawn up within KIST.

The period from about 1976 through 1981 was a stage of basic research into electronic switching. However, by 1981 only about US $600,000 had been invested in the project. Only about ten full-time staff were assigned to the project over a four year period. The low level of investment indicated that Korea was not seriously pursuing the development of electronic switching systems. Most people at that time doubted the nation’s capacity to develop such systems. Because nine other countries overseas had developed electronic switching systems, almost everyone agreed that, in theory, Korea could do the same. But the number of people who truly thought Korea could develop the technology

domestically was very small. Even among specialists, the most common reaction was to say that “in actuality this is very difficult.”

The timing of developments in the telecommunications switching industry worked to Korea’s benefit. Production of electromechanical switches had required the development of a large, dedicated precision engineering capability and a high level of technical skills in manufacturing the multitude of specialized components within a switch. However, in the 1980s the switching industry saw the introduction of microelectronics with fewer moving parts and many more standardized parts. Switches became more software intensive. These changes in turn raised the social benefits for countries like Korea. Software engineers that in the past had stayed abroad to work at Bell Labs or in U.S. universities might now find employment in Korea.\(^78\)

The TDX electronic switching project played a crucial role in allowing South Korea to build a modern telecommunications network and extend phone and other service to citizens nationwide. It fulfilled the twin objectives of coping with the dramatically increasing demand for telephone service and developing an indigenous digital exchange technology. TDX was not only the largest development project ever undertaken in Korea to that date. Also, because switching technology required sophistication in communications, computers and semiconductors, the project had a profound and synergistic effect on the entire electronics industry in South Korea.

**The Debate over Electronic Switching**

The Korean government’s announcement of its commitment to developing electronic switch manufacturing capability was initially greeted with skepticism. After all ETRI, the lead organization for this effort had no prior experience in digital switching technology.\(^79\) Although some staff within ETRI declared that it would definitely happen, some employees of the telecommunications companies strongly voiced a lack of trust in the new technology and underscored the need for caution. There were several arguments against the TDX project, mainly coming from telecommunications service providers and the corporations who would manufacture the switches.

First, the service providers were naturally concerned that any domestically-manufactured switches might not operate reliably and up to international standards. If they did not, from their viewpoint which emphasized high quality customer service, they would be better off using more expensive imported switches.

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Second, companies like Samsung and Goldstar had invested heavily in foreign switching systems. They thought it would be difficult to recover their investment if an indigenous digital switching system came on line too soon.\(^{80}\)

A third argument against TDX basically boiled down to concerns about Korea’s technological capability to succeed. Only nine other countries in the world at that time were manufacturing electronic switches and all of Korea’s efforts during the 1970s had yet to bear fruit. Belgium was the largest exporter of such switches. BTM had a cooperative arrangement with ITT of the U.S. for export, while AT&T made switches only for the American domestic market. Besides these countries, there were only Canada, Germany, Sweden, France, Japan, and Britain.

In the environment of the 1970s when Korean telephone service was so woefully deficient, it was difficult for many to imagine how things could be changed in order to manufacture high quality telephone switches without defects. Even Korean companies who worked with international switch manufacturers, such as Goldstar with the West German company Siemens, argued that electronic switching technology was not an easy project.

There were also arguments in favor of the TDX development project, which ultimately prevailed. First, the price of foreign switches produced locally was higher than the MOC expected the price of local switching technology would be. Given the sad state of the nation’s telephone network as of 1980, the local market for digital switches was large enough to guarantee that Korea would more than recover its investment in the project. Although Korea could invite competitive international bids, there seemed to be no way to reduce the price of switching systems other than developing its own production capability.

During the early years of the project, the price of TDX switches exceeded the hopes of some leaders who had thought the cost could be shaved to the lowest possible price. However, as the government later began to purchase exchanges for rural farming and fishing villages, the capacity of digital switches was good and they could be purchased very cheaply. In fact, the cost of central office switches in South Korea, which had peaked at US$491 per line in 1989, came back down to about U.S. $237 by 1993.\(^{81}\)

A second closely related argument for the project was the interest in building South Korea’s own technology capability. From November of 1980 through July of 1981 Korea sent 40-50 government officials and representatives of manufacturing companies to the United States to receive training on the AT&T

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No. 1A switch. After that training, they continued making their utmost efforts to develop a domestic manufacturing capability.

Some of those who opposed the TDX project started to change their opinions in October 1981 when $24 million was allocated to start full-scale development. However, doubts persisted in some quarters. In 1982 the Telecommunications Strategy Department was established within the Ministry of Communications, and that year marked the formal start of the TDX project which would run through December of 1995. However, even then the commitment to full scale development was still not widely and publicly known.

As Vice-Minister of Communications (MOC), this book’s author consistently emphasized to industry and government colleagues that Korea could domestically develop electronic switching systems. Despite some risk, the benefits of the project were sufficient that it was necessary to push forward with the development. Because ETRI had made the development plan he went so far as to prepare a document containing the names of the people from that institute who would supervise the project and then stamp the document with his official seal. In those days, one’s personal or official seal carried far more weight than a handwritten signature. This stamped and signed document served as official public notice that the MOC would directly decide everything needed to manufacture electronic switches, point by point, all the way through to eventual production operations.82

Secretary Kim Jae Ik and other internationally-educated people had to periodically defend the electronic switching initiative. There was opposition from some people who were influential in business at the time, including one person who was particularly insulting. However, Dr. Kim who was an economist by training was able to blunt such criticism in part because he received advice from top-notch technical experts. One of these was the MIT-trained veteran of Bell Labs, Professor Sang-Hyun Kyong of the Korea Institute of Science and Technology (KIST).

The trials and annoyances associated with the effort to develop electronic switching technology even extended to the international arena. The presidents of certain foreign electronic switch manufacturing companies even came to the Minister of Communications’ office and asked “Do you know how difficult the development of an electronic switching system is?” Also, they occasionally gave advice in a manner that seemed insulting. Some foreign company representatives even commented that “If Korea succeeds in domestic manufacture we’ll have to reduce our international volumes.” These executives didn’t seem to trust what the MOC leadership said and were always trying only to market their country’s brand of switching system. However, three other international manufacturers not only avoided such comments, but also arranged

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independently to assist South Korea indirectly in the development of switching systems.

*The Decision to Invest $24 Million in Development*\(^8^3\)

As Vice-Minister of Communications, this book’s author sought out the advice of Dr. Sang Hyun Kyong, Director of ETRI, regarding the TDX project. He initially sounded him out in a phone call saying “I’ve just got one thing to bring up with you today. We need to push for domestic manufacturing of electronic switches. With our present technology is this possible?” The research institute director reacted somewhat skeptically saying “Although it is relatively small, this project would require an appropriation of about $10 million.”

Upon hearing this the Vice Minister said “Then if I give you $10 million can you do the project?” “Please give me some time” Dr. Kyong responded and immediately after that phone conversation he began full scale deliberations within the research institute.

One week later Dr. Kyong and four ETRI administrators visited the Vice-Minister and said that they required $10 million. They also said that if the work didn’t go well the supervisors would write letters of resignation. In response, the Vice Minister advised them that “anyone would write a letter of resignation on the day work on a project is ending” and asked them to have confidence! He noted that “If we can succeed this time in developing TDX, anything will be possible in the future. If ETRI can become established without problems as a single, recognized institute then the technology specialists will have to give their best performance if they don’t want to be outcasts there.”

With support certain, Director Sang-Hyun Kyong and the research administrators started to show an enterprising spirit. The papers were formally drawn up, with the final appropriation boldly set at $24 million. With no objections being lodged, the Vice Minister approved South Korea’s very first research and development project of such magnitude. Everybody around him worried about everything. “How can you so resolutely decide to approve such a dangerous project?” they asked. The doubters questioned “How can a young, 42-year old Vice Minister with no experience make such a decision?” and “How can we later supervise the expenditure of this much money?” These were among the harsh criticisms at the time.

However, the young vice minister was confident, from the beginning to the end that it was an extremely easy project. His prior experience with computer development in the military convinced him that a $24 million budget would at a minimum it produce some type of electronic switch. If it could be used in the

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domestic market, the market was sufficient to support it.\textsuperscript{84} Although $24 million was the initial investment, when all was said and done, the TDX-1 R&D budget actually, totaled USD $31.6 million.\textsuperscript{85}

\textit{The Structure of Technological Innovation}

At the heart of the TDX project, ETRI was responsible for the development and control of major parts of the switching system. This involved high level design and system integration. ETRI was assisted in its basic research by a host of public universities and other government research institutes. The basic technology was then transferred to four Korean manufacturers: Samsung, Goldstar, Daewoo and Hanhwa. In fact, the total manufacture of equipment was equally divided among these four companies.

The main customer, Korea Telecom, provided all of the funds required for the project and was responsible for program management. It provided user requirements and conducted required qualification tests to ultimately commercialize the technology.\textsuperscript{86}

In 1982, the same year that it had decided to pursue its own domestic switching technologies, the government, with the help of Korea Telecom and KIST, launched a 500-line phone networking pilot project in a post office in Yongin. Dubbed TDX-IX, it was the first switching system developed with domestic switching technology.

Building on the skills and confidence gained from this pilot project, ETRI created a TDX development team and installed 24,000 lines in 24 districts. This effort enabled Korea to become the tenth country in the world to develop an electronic switching system.

Through the conclusion of the TDX program in December of 1995, it consisted of three major versions. The smallest version, TDX-1, could accommodate up to 10,240 subscribers and was designed for use in rural areas and small cities. The TDX-1B system, which could accommodate up to 22,528 subscribers, was designed with medium-sized cities in mind. Finally, TDX-10, which is the largest system and could accommodate up to 100,000 subscribers was designed for use in metropolitan areas.


\textsuperscript{86} Mahlich, Jorg C. and Werner Pascha. \textit{Innovation and Technology in Korea: Challenges of a Newly Advanced Economy}. Physica-Verlag, 2007, p. 274.
Overall Results of the TDX Project

The TDX project had a development history of 20 years, during which considerable improvements were made in the design based on the shifting technological frontier. For example, the number of subscriber lines increased from 10,240 with the TDX 1A to 100,000 with TDX 10.87

Over its first decade of commercial use, Korea installed 15 million TDX lines, which accounted for more than 40 percent of the nation’s telecommunications network. The bottom line was that Korea’s home grown telecommunications industry greatly improved telephone services nationwide, while saving each subscriber an estimated 40 percent for this vital service, compared with the costs that would have been incurred if the system had continued to rely on non-Korean manufacturers.88

A second and arguably more important result of the TDX project stems from the sophisticated knowledge of communications, computers and semiconductors that the project required. As a result, the TDX project paid huge dividends for many other high-tech industries including the development and manufacture of computers, consumer electronic equipment and high-tech components for a wide range of goods and services that relied on semiconductors for improved performance.89

A third benefit of the TDX project was the creation of intellectual property in Korea. As of 1999, over 500 patents had been registered for more than 500 TDX system components and 300 TDX software programs. Switching technology, as with other key technologies in the digital age, is a continually moving target. By the early 1990s Korean corporations had begun to develop their own versions of the TDX and to invest more in telecommunications research and development. In 1994, Yang Seung Taek, then President of ETRI, estimated that 20-25 percent of the microprocessors in the TDX-10 were imported, but the ASICs, which are critical in differentiating a product, were designed by ETRI. In that sense, the firms were still very dependent on ETRI for technology. They felt that in the newer products, such as ATM switching systems, the pace of development was too slow to keep up with global competition. To accelerate the development of new products, Samsung and Goldstar began entering into strategic partnerships with a number of overseas firms.90

The TDX manufacturers in South Korea also achieved success in exporting the technology. As of 1999, there were TDX exports to more than 20 foreign countries, including the Russian Federation, the Philippines, Nicaragua and Iran. More than 3.6 telephone lines worldwide used Korea’s TDX and the total export value of these switches was estimated at US $700 million.

TABLE 2.1 ABOUT HERE
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The total R&D cost of the TDX project has been estimated at U.S.$ 213.9 million. In economic terms, the TDX project had a large market creation effect in that total domestic and foreign sales of the product far exceeded the total R&D investment. The ratio of domestically produced switches to imported switches continued to increase and has exceeded unity since 1991.91

Finally, perhaps the most important consequence of the TDX development project was the confidence that its success instilled in everyone involved. In the end, the leadership team that developed TDX adopted the following motto: “We developed it with our brains, we made it with our hands, we teach and learn it in our language, it matches our reality and we will use it the way we wish! And one more thing, we planned the design for high product quality and safety!”

Word of the success of the TDX development spread far and wide in South Korea and it became a prominent symbol of the hope that the nation could continue to advance through science and technology. With newfound confidence, South Korea would move on toward successful innovation in the semiconductor industry, as described in this chapter, and in the development and commercialization of CDMA technology for mobile communications, which will be dealt with in Chapter 6.

The Creation of Korea’s Semiconductor Industry

The semiconductor industry is one of the world’s truly global industries in that production and trade are conducted based on knowledge intensity and value-added, rather than location advantages, volume or freight charges which dominated earlier industries. One feature of Korea’s industry is that it concentrated relentlessly, from the beginning, on memory chips. The expansion of the DRAM segment of the semiconductor market was remarkable, from introduction of the first 1K DRAM in the early 1970s to a market valued at $40 billion by 1995. Also, the dynamics of competition in the memory chips sector are extremely demanding, with ultra short product cycles that call for expensive investment in new process technology every two to three years. Korean companies learned to manage these product cycles.92

The creation of a real semiconductor industry in South Korea was a critical component of the information revolution here because of its relationship to technological progress in several other key areas. First, digital switching was at the heart of modern communication networks, whether fiber optic or wireless.


The TDX project simply could not have succeeded without considerable expertise and sophistication in semiconductors. By the same token, progress in South Korea’s telecommunications sector helped to fund the large investments in semiconductor fabrication that were necessary for the country to succeed in the global market. Second, today’s world-leading display and television industry also depends upon semiconductors. Not only do high definition television sets contain semiconductors, but the manufacturing techniques for LCD displays borrow heavily from methods used in the fabs that manufacture semiconductors. Finally, semiconductors comprise the most important components of mobile handsets, as well as notebook and desktop computers and a host of other electronic devices.

**The Historical Roots of Korea’s Semiconductor Industry**

South Korea’s semiconductor industry emerged in several distinct stages. The first stage, prior to 1974, consisted of preparation to enter the semiconductor market, which was then dominated by the U.S. and Japan.

In 1965, a small American company, Komi, invested in transistor/diode production facilities in Korea. While that investment itself was rather small, it had a useful demonstration effect. By the mid-1970s there were nine U.S. owned semiconductor facilities and seven Japanese companies operating in Korea.  

President Park Chung Hee took a personal interest in the emerging electronics industry in the late 1960s. In August of 1967, he summoned Dr. Kim Wan-hee, then a first-year professor of electronics at Columbia University to the Blue House for advice on how to get an electronics industry started in Korea. After four days of field study showed Dr. Kim was shocked to note “…that the top factories and companies in Korea were built on top of red soil, in the farm and on unpaved ground. There were electronic products being put straight on that soil!” This of course, was in striking contrast to the clean rooms in modern electronics plants.

At that first meeting, President Park asked Dr. Kim to help Korea develop an electronics industry. Dr. Kim became influential in convincing the CEOs of Samsung, LG and eight other companies to begin work in the electronics industry. Over the decade following his 1967 Blue House visit he exchanged about 150 letters with President Park Chung Hee.  

In addition to foreign investment by U.S. and Japanese companies, another important development was the establishment of technical and engineering

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institutes in South Korea. In 1966, the Korea Institute of Science and Technology was founded. The institute at once provided a focus for advanced technical training and also increased the nation’s capacity to absorb high technology.

Korean research institutes doing research on semiconductors and computers were located mainly in and around Gumi in North Kyongsang Province, which by no sheer coincidence happened to be President Chung Hee Park’s hometown. However, the electronics technology research institutes needed to attract capital funds from international banks which strongly opposed moving the research institutes to Gumi.95

In 1974 a second stage in the development of Korea’s semiconductor industry began with the founding of a Korean chip operation called Korea Semiconductor. It was the first plant to produce CMOS Large Scale Integrated (LSI) chips in South Korea. Because of financial problems, it was soon sold to Samsung and was renamed Samsung Semiconductor in 1978.96 This marked the emergence of a genuine semiconductor industry under Korean control.

By the late 1970s there were four private companies involved in LSI semiconductor manufacturing. Along with Samsung, they included Goldstar, Daewoo and Taihan. At the start of the 1980s, these four firms were operating in the semiconductor wafer fabrication industry. However, they were still using LSI technology while the Americans and the Japanese had moved on to VLSI (Very Large Scale Integration—with between 100,000 and one million transistors per chip).

In 1982 the Korean semiconductor industry entered a third stage as the Chun government was eager to see Korean electronics companies take the plunge into VLSI semiconductor production. Huge capital investments would be needed for this project, on the order of hundreds of millions of dollars. The government’s role was one or spreading and reducing risk as much as possible by arranging finance and guaranteeing loans.

**The Role of the Chaebol in Technology Development**

The promise of government support, along with direct government prodding prompted Samsung, Hyundai and Goldstar to announce in 1982 that they would make major investments in production of chips at the VLSI technology level, particularly MOS (metal oxide on silicon) memory chips such as DRAM (Dynamic Random Access Memory) chips. Although the government played an important role at this critical stage in the development of South Korea’s semiconductor industry...


industry, its emergence was led by three large industry groups. Unlike the TDX project, government attempts to coordinate the efforts of major industry players were somewhat futile as each of these groups adopted a different strategy and they competed with each other to gain market share in the semiconductor industry.

In February 1982, Lee Byung-Chull, the founder and chairman of Samsung famously announced that Samsung intended to become a world player in memory chip production. Moreover, he was prepared to put up $100 billion won – an astonishing $133 million—to back his assertion. In effect, he was betting the future of the company on semiconductors.97

For Samsung, as for the other leading Korean companies, the road into the global semiconductor industry and mainstream chip production led through Silicon Valley. It was the location of many world-renowned semiconductor firms which employed U.S. trained Korean-American engineers who could be hired by the Korean chaebol at attractive salaries by appealing to their national pride. Silicon Valley was also home to many capital-starved startup firms, some with excellent chip design know-how, but no manufacturing capacity. Korean companies offered these small U.S. design houses good terms for the manufacture of their chips in return for the right to license their designs. And so it was that small firms like Mosel, Vitelic and Micron and others became the source of Korea’s new technology.98

The announcement by Samsung’s Chairman Lee was followed by similar announcements from Goldstar, Daewoo and Taihan. Then Hyundai announced that it intended to enter the semiconductor field and industrial electronics generally, backed by an investment commitment of $300 billion won ($400 million) over a five year period, the largest commitment to that date. Hyundai’s announcement led Samsung and Goldstar to announce increased commitments of their own.99

One estimate is that the four major players in Korea’s semiconductor industry invested more than $1.2 billion between 1983 and 1986, ten times the scale of investment in Taiwan’s semiconductor industry over the same period. Furthermore, from 1983-1989 their total investment is estimated at approximately $4 billion. The push into VLSI semiconductors not only took the industry to a new level of technological sophistication, but also to new heights of financial

leverage. The investment initiative now lay with the firms themselves, more so than with the government.\textsuperscript{100}

In December of 1983 Samsung announced that it had produced a good working version of a 64K DRAM, which was then a state-of-the art product in the semiconductor industry. However, by the time production was underway, the Americans and Japanese were already producing the next generation 256K DRAM. The \textit{chaebol} made Herculean efforts to establish new VLSI chip fabrication plants in 1983 and 1984, but by the time marketable products were available, the semiconductor industry was heading into a cyclical recession. Not surprisingly, early sales in the U.S. market were dismal.

\textbf{The 4MB DRAM Project}

These developments prompted a furious debate within government and business circles. The influential Economic Planning Board, backed by banks, argued that Korea had no future in this risky business. The Ministry of Trade and Industry, on the other hand, argued that the setbacks were cyclical and the Ministry of Science and Technology became a major proponent of state support for Korea’s long-term transition to a knowledge intensive economy.

In 1986 Kang Jin Ku, the Chairman of Samsung Electronics and Telecommunications approached President Chun with a plan for a Korean 1M DRAM development consortium to be coordinated by the industry research body ETRI. The plan called for a modest government development budget to be matched by the companies concerned—Samsung, Hyundai and Goldstar. The consortium was extended to include the development of a 4M DRAM, which would become the world market leader by the early 1990s\textsuperscript{101}

In this manner, it was industry initiative that led to the 4MB DRAM project. Several studies of Korea’s entry into the semiconductor market make it clear that the role of the government was supplementary to the already-established DRAM trajectory of the major companies involved.\textsuperscript{102} Nevertheless, the government played an important role. One study concluded that, although Samsung could have developed the 4MB DRAM without it, the consortium project helped Samsung to shorten its development time, an extremely important factor in the DRAM market. It narrowed its gap with the market leaders to only six months. The project was even more useful to the follower firms, Hyundai and Goldstar, who benefited from Samsung’s more advanced knowledge despite a real lack of

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cooperation. Another study noted that “The leading role played by government in securing Korean foundations in the semiconductor industry was very significant but limited in time to the seeding and propagation phases, lasting for around a decade from the mid 1970s to the late 1980s.”

In 1987, Japan and the U.S. settled their trade differences in the Semiconductor Trade Agreement, limiting Japanese access to the U.S. market and setting a floor price for semiconductor products. Both these aspects of the agreement favored Korean producers and in 1987, with the boom in personal computers, Korean firms were able to sell all the chips they could produce.

In the 1990s semiconductors became South Korea’s largest export item and remained so even after the 1997 Asian financial crisis. Also, as touched on earlier, the global semiconductor market experienced a major shift in the geography of industrial activity from the U.S. and Japan to other nations of East Asia, including Korea.

At first there were people who asked why, if we manufactured telecommunications equipment, we should proceed all the way to semiconductor manufacturing. The TDX development naturally turned into manufacturing. After developing the TDX, it turned out to be a superior switch with competitive strength. However, some argued that this scenario would be unlikely to occur with semiconductors.

Nevertheless, because the question of making good equipment for use in telecommunications involved semiconductor research, telecommunications manufacturing naturally involved managing semiconductors. Without semiconductor development, telecommunications construction would naturally run up against physical limits. In this respect Moore’s Law has had a tremendous impact not only on the semiconductor field, but on telecommunications. In Korea, one of the first things Dr. Kyong, Sang Hyun did after going to ETRI was to foster the integrated field of semiconductors, computers and telecommunications in Korea. This field of information technology was by then widely recognized around the world.

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The Start of Color Television

Back in the 1960s and 1970s, it was hard for visitors not to form a predominantly black and white image of the country. At that time, Korea was indeed a war-torn, developing nation, whose mountains were lacking trees and vegetation.

In those days all of the road signs and signs on buildings were in the distinctive hangul script, but they were all in black and white. This was the situation through 1980. At that time, if someone had conceived of a giant electronic television screen on the side or top of a high rise office building, there would have been no color television content for it to convey. Although over 100 other nations had started color television broadcasting, South Korea was not among them.

Goldstar, the predecessor of today’s LG Electronics, came out with Korea’s first black and white television set in 1966, through an agreement with Hitachi of Japan. In 1977, the first color TV came off a Goldstar assembly line. However, Korean companies manufactured nothing but the box, while all of the components inside it were imported, mostly from Japan. Moreover, even if a wealthy Korean family purchased a color television, there was no color telecasting, so they were limited to watching color videotapes.\(^{107}\)

Why had the color television industry not developed? First, the government had forbidden both the sale of color television sets and color television broadcasting. Government restraint was a major reason that the color television industry did not develop in South Korea before 1980. At the time, it seemed that the remaining electronics industries also died together with it.

A second factor was that a basic philosophy of Park Chung Hee’s government was “exports first” or nation-building through export promotion. This strategy prohibited the domestic sale of color TVs until 1980, so until that date manufacturers could sell their products only in overseas markets.\(^{108}\)

Think of the impact that the lack of color television had in Korea. Color television itself occupied a portion of the electronics market. However, beyond that and more importantly, if color television companies grew, the supporting components industries would also grow, just as they had earlier in Japan. If the components industries grew, then companies making sound recording and playing devices that use the components would also grow along with virtually all electronics industries.

The very first concrete undertaking assigned to this book’s author as a member of the Special Committee for National Security was to see that the sale of color television was permitted for public viewing.\(^{109}\)

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television sets was initiated. However, even though this measure was put in force, color television sets did not sell well. The reason was simple. They didn’t sell well because there was no color broadcasting.

Although the government eventually insisted upon color television broadcasting, the decision involved a lot of friction with other members of the committee. Under President Park Chung Hee, the issue of color television broadcasting had been a source of dissension among citizens. It is an historical fact that, as of 1980 color television was simply not a question to be brought up for discussion. Many people held fast to that view. Even some members of the Special Committee for National Security said without hesitation that color TV sales were unacceptable and broadcasting in color even more unacceptable. Both, it was argued, would foster social divisions. The issue remained highly politicized and divisive, despite the fact that more than 100 other countries around the world were already broadcasting in color. Some people even took pride in arguing that “Even though our country ranks lower than 100th in the world we are a country that doesn’t permit it!”

Despite the continued debate, color television broadcasting was introduced to South Korea in 1980. As later chapters of this book will make abundantly clear, this decision was a key element in invigorating the electronics industry and it led to the development of color television sets and displays as one of the nation’s key export sectors in the 21st century.

**The Legacy of the 1980s Telecommunications Revolution**

In the space of a decade, it seemed that South Korea had caught up with international trends in digital communications. Also, South Korea’s social, political and economic structures were all back on a solid footing. Economic progress had accompanied political democratization and the export-led economy was taking off, benefiting from the positive exposure provided by the Seoul Olympics.

Institutionally, the Ministry of Communications had established it by the decade’s end as one of the most powerful governmental ministries. It was affiliated with an array of new organizations, public and private, that had not existed in 1980. Both the Blue House and the country’s leading economic bureaucrats now acknowledged the importance to Korea of skilled policy and technical advice in the ICT Sector.

In terms of policy, over the course of the decade, the balance swung rather decisively from public to private, as the nation created new companies and began the process of privatization. The balance of policy also began to move away from monopoly toward competition. The approach to policy remained largely centralized rather than distributed. Throughout the 1980s, the focus was
largely on strengthening Korea’s domestic market and technology capacity, but there were glimmers that this would begin to change.

While there were many criticisms of the 5th Republic on other matters, most observers acknowledged and approved of the government’s build up of the telecommunications sector. The Blue House’s Economic secretariat played a very large role in those epoch-making developments. It played the role of an orchestra leader while each government ministry or office provided its specific services. During the 1980s the technical skills of government offices were woven into the work of supervising economic plans.

On reflection, the telecommunications revolution of the 1980s in Korea had several important results. First and foremost, the “telecommunications revolution” led to the development of greater citizen awareness. The country’s leading telecommunications policymakers came to believe that the free flow of information promotes the public welfare, and consequently he focused a great deal of energy on raising citizen’s awareness.

A second result of the revolution was to convince the nation’s economic bureaucrats of the importance of telecommunications networks. Leaders in the MOC and the telecommunications sector stressed that they were not just expanding simple phone service. Instead they were resolutely pursuing a strategy of investing the earnings from the first network development in the cities and universally opening up the PSTN (Public Switched Telephone Network). This opening meant that facsimile machines, computers and other terminals could be connected to the network. It took about a year and a half, creating some degree of debate and disturbance, to get mutual agreement from all the relevant government organizations on this strategy, but it brought increased institutional power to the Ministry of Communications, a trend that would continue into the 1990s. After this action, facsimile companies became the rage and all kinds of electronic terminals, including the EasyCheck terminals to check credit card transactions, spread rapidly contributing to a big growth in the electronics sector.

A third result of the revolution grew out of the determination to promote “domestic manufacture,” and was exemplified by the TDX-1 electronic switching system. In a single stroke Korea became only the tenth nation in the world to manufacture electronic switching systems. The timing of this development, coming just before the 1988 Seoul Olympics, offered an exceptional opportunity to make the level of Korean scientific and technology exports much more widely known around the world. After TDX, came successful development of the 4 Mb DRAM which, more than any other accomplishment, showed the strength of South Korea’s technology.

The fortuitous timing and influence of the 1988 Seoul Olympics should be underscored. There are three major considerations in this regard. First, the Olympic Games, as of 1988, were the perenniially the world’s largest planned media event. This meant that state-of-the-art media and communication systems
were needed to successfully host the games, and also that the Olympics offered an unequalled opportunity to promote Korea’s ICT development and the possibility of future exports.

Second, the Olympic Games were successfully used by the Korean government, under President Roh Tae Woo, to bolster the “northern policy” of opening up diplomatic, economic and cultural relationships with the former Soviet Union, China, and other socialist nations including Vietnam and Eastern European countries.

The third consideration is timing. To the extent that Korea had achieved successes in digital development before the Seoul Olympics, it was able to maximize the impact of the global exposure provided by those games.\footnote{109}

Finally, we should note that the Korean government itself made the decision to begin liberalization of the IT sector in 1980. It was government led, discretionary liberalization in which the Korean government itself made the major decisions, such as how many entrants to allow and how strong these entrants had to become to compete with the vertically integrated incumbent.\footnote{110}

All told, the remarkable developments of the 1980s in South Korea illustrate the characteristic of information that economists call the “on the shoulders of giants” effect. Absent the epochal developments of the 1980s, it would have been nearly impossible for younger generations of engineers, scientists and government officials to achieve what they did in the 1990s and in the first decade of this new century. Not only the crucial store of information about electronic switching, semiconductors and the like was transmitted to subsequent generations, but also the confidence to carry on with a vision that inspired them! That is the story we tell in the remaining chapters of this book.


\footnote{110} Lee, Seungjoo. “Transforming the Developmental State in Korea Under Globalization: The Case of IT Industry,” (finish citation)
Chapter 3: Government-Led ICT Development in South Korea

The concept of leadership is frequently invoked to help explain the successful use of information and communication technologies in the service of national development. As Wilson put it, “Without local political leadership the information revolution cannot move forward. Leaders must be willing to press changes in the face of institutional rigidity, technological backwardness and political resistance. . . .Without politics and political leadership, the information revolution simply does not occur.”

South Korea is now widely acknowledged to be a model case of government-led telecommunications development. The World Bank’s extensive study of Korea as a knowledge economy stated that “…the Korean government assumed the very necessary proactive leadership role of supporting the market and providing an environment that would foster and sustain the transformation.”

Korean government leadership under Park Chung Hee and through the HCI reforms in the late 1970s resembled the developmental state that had propelled development in Japan and in other newly industrializing East Asian economies. However, beginning in 1980 under the leadership of individuals like Kim Jae-ik, Korea took a decisive turn toward economic liberalization, including liberalization of the telecommunications and electronics sectors as a development strategy. That government sanctioned liberalization is what propelled Korea, within a decade or two, from being a follower in the world telecommunications market to one of the global leaders.

Other chapters describe major projects through which the Korean government built new digital networks, used its purchasing power to encourage new ICT products and services, and coordinated vast public education efforts. In this chapter we look at changes in government institutions, restructuring policies and laws. To put a human face on leadership processes, we introduce several influential leaders of the 1980s telecommunications revolution. Our goal is to more fully describe key aspects of leadership in the Korean case.

Patterns of Institutional Change

Korea has a long history of centralized political power. In contemporary Korea, the apex of political power is found in the Blue House, the nation’s presidential office and residence.

The scope of political change in South Korea from 1980 to the present is breathtaking, encompassing political liberalization and accompanying changes in the press and media. With respect to the increasingly important matter of telecommunications policy one of the salient changes was the growth in influence of the Ministry of Communications, which grew from being a weak ministry in 1980 to become one of the leading ministries.

Creation of ICT Sector Institutions

One aspect of the growing influence of the Ministry of Communications was the creation and strengthening of several other key institutions in the telecommunications sector. They included the following.

- **The Information Communication Training Center**, founded in 1984 was reorganized as the **Information Culture Center** in 1988 and today is known as the **Korea Agency for Digital Opportunity and Promotion (KADO)**. KADO is the principal Korean government agency whose mission it is to reduce the digital divide, both inside Korea and, increasingly, in other countries through training programs with representatives from developing nations.

- **The National Computerization Agency (NCA)--Now the National Information Society Agency (NIA)** was established in January, 1987. One of its early assignments was construction of the National Basic Information System (NBIS). In 2006 the agency’s name was changed to the National Information Society Agency (NIA). In 2008, the Agency’s major government counterpart was changed from the MIC to the Ministry of Public Administration and Security (MOPAS).

- **KISDI, the Korea Information Society Development Institute** was founded in 1988 to conduct telecommunications policy research in support of the government’s effort to build an information society. In January of 1999 KISDI changed its affiliation to the National Research Council for Economics, Humanities and Social Sciences under the umbrella of the office of the Prime Minister.

- **KCC the Korea Communications Commission** was created in 1991. Modeled after the U.S. FCC, it approves common carriers, conducts reviews to ensure fair competition and recommends policies. It took over functions formerly handled by the telecommunications policy bureau within the MOC.

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In addition to the institutions affiliated with the MOC (later MIC), there were two important institutes associated with the Ministry of Science and Technology.

- **ETRI, The Electronics and Telecommunications Research Institute**, was founded in 1985 under the Ministry of Science and Technology through a merger of KIET and KETRI. Beginning with the TDX project, ETRI would play a key role in technology development and innovation that boosted Korean telecommunications and led to ETRI’s current international recognition as a major telecoms research institute. The increasing revenues from telecommunications services and the legal requirement that 3 percent of profits be invested in research and development helped ETRI enormously. In 2002 the mandatory annual contribution from service providers to R&D was reduced from 3 percent of sales to 0.5 percent.116

- **Korea Institute of Science and Technology** was founded in February of 1966. After being integrated with the Korea Advanced Institute of Science, it was renamed the Korea Advanced Institute of Science and Technology in 1981.

The Ministry of Culture and Tourism has traditionally also had control over the content side of telecommunications, particularly the game industry.

- **The Korea Game Industry Agency (KOGIA)** was established in 1997 for game industry development and promotion. In 1999 the Integrated Game Support Center was opened and in 2007 the agency name was changed to the Korea Game Industry Agency.

- **The Korea Institute for Electronic Commerce (KIEC)** established in 1991 as the Korea EDIFACT Committee (KEC). In August of 1999 it was renamed the Korea Institute for Electronic Commerce. It operated under the Ministry of Commerce, Industry and Energy.

- **MIC, The Ministry of Information and Communication** was created in 1994. The Kim Young Sam administration, with its overall emphasis on segehwa, quite naturally had a politically driven focus on IT development. In 1994 it further strengthened the Ministry of Communications as the lead bureaucracy for telecommunications policymaking. It expanded the power, jurisdiction and functions of the MOC and renamed it as the Ministry of Information and Communication (MIC). The MIC was given sole responsibility for the IT sector absorbing the industrial policy functions from the Ministry of Trade, Industry and Energy and the Ministry of Science and Technology. A series of politically driven policies – the “Basic Act on Informatization Promotion” in 1995, and an “Information Promotion Fund” in 1996 –strengthened MIC’s legal and financial tools to

guide IT policy. In contrast to Japan’s MPT at the time, Korea’s Minister of Information and Communication, appointed by the President, was always a distinguished expert in IT, facilitating decisive policymaking and strengthening the legitimacy of the MIC’s policies.

Of course, by 1994 the role of ICT in Korea was so pervasive that it was impossible to completely separate ministerial responsibilities. For example, the Ministry of Culture and Sport still had some major responsibilities for media content. Likewise, the Ministry of Science and Technology remained involved in research and development, as did the Ministry of Education. Obviously, the Ministry of Trade, Industry and Energy retained many concerns with key industry participants in Korea’s telecommunications sector.

- **The Informatization Promotion Committee** was established in 1996 and President Kim Young Sam declared informatization a top national priority. The committee included representation from all government ministries and agencies and was headed by the Prime Minister. The successive “Master Plans” for informatization that were announced in 1995 (Basic Act on Informatization Promotion), 1999 (Cyber Korea 21) and 2002 (E-Korea Vision 2006) all benefited from President Kim’s elevation of their efforts to that of a top national policy priority.

The National Science and Technology Council has been the highest decision making body of the Korean government on science, technology and innovation issues since 1999. In that year the President took over the chairmanship of the NSTC in an effort to strengthen it and eliminate program overlap and duplication among ministries which had occurred in the 1980s and 1990s. The Presidential Advisory Council on Science and Technology (PACST) also plays an important role in policymaking in Korea. It was established under the Constitution in 1991 to advise the President on science and technology policy and developments. It consists of 30 members representing industry, academia and government research institutes. Members are appointed by the President for a one year term. It meets monthly and presents recommendations to the President at least twice yearly. In practice, the President and the Prime Minister use the PACST to listen to the voices of the private sector and the diverse science and technology sector.

**The 2008 Government Reorganization and Streamlining**

As the new administration of President Lee Myung Bak took office in 2008 there was a sweeping streamlining and reorganization of government, with dramatic immediate effect and probable long term consequences for policymaking in the ICT sector. The reorganization replaced the MIC-centered framework with a new

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one in which ICT would be combined with the functions of each ministry. At the ministerial level, it included the following key changes.

- The Ministry of Information and Communication (MIC) was eliminated.
- The Ministry of Science and Technology was also eliminated.
- The world’s first Ministry of Knowledge Economy (MKE) was created, merging the former Ministry of Commerce, Industry and Energy with elements of the Ministry of Information and Communications, the Ministry of Science and Technology, and the Ministry of Finance and Economy. The parts of MOST that were merged into the MKE included those concerned with the Daedok Innopolis and other cluster programs.
- The Ministry of Public Administration and Security (MOPAS) assumed the MIC’s former responsibilities for national informatization.
- A new Ministry of Education, Science and Technology resulted from combining the old Ministry of Education and Human Resources with the former Ministry of Science and Technology.
- An expanded Korea Communications Commission (KCC) was formed to deal with the convergence era and handle the core functions of the former Korean Broadcasting Commission and the telecoms policy section of the Ministry of Information and Communication.

Beyond the top level and ministerial changes introduced by the Lee Myung Bak administration, the streamlining and reorganization made itself felt at all levels of government. In particular, there was consolidation of the government organizations responsible for informatization, ICT infrastructure, ICT industry and content, as follows.

**Informatization** – The National Information Society Agency and the Korea Agency for Digital Opportunity and Promotion were merged into a single organization which kept the same name in English. In Korean, it became the *Chong-bo Munwha Jin-heung-won*, or Information Culture Development Agency. The purpose of this merger was to allow a comprehensive approach to the promotion of informatization, the expansion of information culture, and efforts to deal with adverse effects of informatization under MOPAS.\(^{120}\)

**ICT Infrastructure** – The Korea Internet Security Agency (KISA), the National Internet Development Agency (NIDA), and the Korea IT International Cooperation Agency (KIICA) were combined to form the Korea Internet and Security Agency (KISA).

**ICT Industry** – To support the IT industrial policies of the MKE, the Korea IT Industry Promotion Agency (KIPA), the Institute for Information Technology Advancement (IITA), and the Korea Institute for Electronic Commerce (KIEC) were merged to form the National IT Industry Promotion Agency (NIPA).

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Contents – Five agencies with responsibilities for content were merged. The Korea Culture and Content Agency (KOCCA), the Korea Broadcasting Institute (KBI), the Korea Game Industry Agency (KOGIA), along with the Cultural Contents Center and Digital Contents Division of the Korea IT Industry Promotion Agency (KIPA) were combined to create the Korea Creative Content Agency (KOCCA) under the Ministry of Culture, Sports and Tourism.121

The publicly announced purpose of President Lee Myung Bak’s changes and consolidation of ministries was to further his drive to reduce the size of government and the number of ministries in the executive branch. As such, it could not be interpreted as a verdict on the operation or performance of any individual ministries. Indeed, as it related to the ICT sector, the creation of the Ministry of Knowledge Economy and the increased stature given to an expanded KCC were evidence of a continued commitment to building an information society in Korea. In any event, informatization and the goal of becoming the world’s first ubiquitous network society were already written by law into the governmental agenda at the highest levels. However, we must note that the elimination of the Ministry of Information and Communication took place against a long history of its rivalry with the Ministry of Commerce, Industry and Energy (MOCIE), and in a manner that appeared to favor the MOCIE.

In terms of telecommunications policy, the new government of Lee Myung Bak argued that its creation of the KCC was intended to accelerate convergence in communications and encourage competition, innovation and growth in this important sector. However, it goes without saying that the elimination of two such influential ministries in the latest government reorganization was a controversial move.

As this book goes to press, it is still too early to assess the long-term effects of President Lee’s sweeping reorganization of government on telecommunications policy and information society development. However, two things seem to be clear. One is that governmental reorganizations are a fact of life in South Korea. The second is that not all leaders within the nation’s telecommunications sector agree with the changes.122

Prior to President Lee, Myung Bak’s reorganization, there were four main ministries involved in Korea’s research and development spending, if defense spending is excluded. They included the Ministry of Science and Technology and the Ministry of Commerce, Industry and Energy, with very similar levels of spending. The Ministry of Education and Human Resource Development had


less than half the spending of MOST, and the Ministry of Information and Communication had about a third of its level.\textsuperscript{123}

Following the sweeping reorganization of 2008, science and technology administration in the Korean government involved a National Science and Technology Council reporting directly to the President. The three most powerful ministries were the Ministry of Knowledge Economy, the Ministry of Education, Science and Technology, and the Ministry of Strategy and Finance. All three reported to the President through the Prime Minister’s office.

**Decentralization and The Increased Role of the Private Sector**

A second important feature of the institutional changes occurring in South Korea, especially since the turn of the century, is decentralization. The promulgation of laws and national plans have traditionally been important means to coordinate national science and technology policy and innovation in Korea, including the all important telecommunications policies. However, in recent years, Korea has faced a growing multi-actor landscape and an expanding list of policy options. This has made top-down direction setting more difficult and has necessitated the use of complementary system-wide approaches.

The Vision 2025 report by the Presidential Advisory Council on Science and Technology (PACST) in 1999 recommended the following fundamental shifts in Korea’s science and technology policy:

- From a government led and development oriented innovation system to a private industry-led and diffusion-oriented innovation system.
- From a closed R&D system to a globally networked R&D system.
- From a supply-dominated investment enhancement strategy to an efficient utilization and investment-distribution strategy.
- From a short-term technology development strategy to a long-term market-creating innovation strategy, and
- Towards establishing a science and technology-led national innovation system.\textsuperscript{124}

In mid-2004 an implementation plan for the National Innovation System was launched with the goal of moving from a catch-up to a creative innovation system. This reflected the government’s view that Korea had reached technological frontiers in several areas, most notably in the ICT sector. While the government plan designated the Minister of Science and Technology as a Deputy Prime Minister and gave MOST overall responsibility for Science and Technology policy, it recognized that governments alone cannot implement national innovation systems. Today, they depend upon the actions of a constellation of actors, both public and private, and the linkages among them. There is a clear move toward


decentralization, while the role of the government moves from leader, as in the developmental state, to that of an orchestra-conductor in the new 21st century environment.

A third broad aspect of institutional change in South Korea over the past three decades has to do with the increasing role of the private sector in the nation’s digital development. One good indicator, as shown earlier in Table 1.2 is that the private sector’s share of gross expenditure on research and development rose from 22 percent in 1962 to 75 percent in 2005. As of 1980, it was only at 50 percent.

Without question, the large chaebol enterprises, led by Samsung, LG and Hyundai, have come to symbolize the growing role of the private sector. To younger generations around the world, Samsung Electronics, LG Electronics and Hyundai automobiles represent the new Korea. However, the developments chronicled in this book have also greatly increased the number of small and medium-size companies in South Korea who act as suppliers and manufacture parts and components for the giant electronics companies.

**Government Policies to Restructure Telecommunications**

The policies enforced by the Korean government in the ICT sector from 1980 onward were aimed at protecting Korean companies until they were strong enough to compete with international telecoms entities. The government itself initiated privatization and the introduction of competition into the marketplace, but on a basis that would allow its own companies to thrive in a growing global marketplace, rather than remaining dependent on imported electronics components. One central concern was to develop the ability, in Korea, to manufacture and export key electronics technologies.

After providing basic telephony to its general public in the 1980s, Korea began more actively deregulating and restructuring its telecommunications market in the 1990s. The Korean government, acting as policymaker, regulator and largest stakeholder in the dominant service provider, Korea Telecom, played a central role in the restructuring. However, another major factor in the restructuring was the pressure for market opening that originated in trade talks, initially through bilateral talks with the U.S., and subsequently the multilateral GATT and WTO negotiations. At the very least, trade negotiations provided a means for Korean policymakers to effectively manage pressure against opening the market.125

While the government tried to manage international pressures, the influence of international developments was undeniable. There were bilateral trade talks with the United States and WTO negotiations. As Korea’s ICT exports rather dramatically increased, so did its stake in international trade negotiations.

125 Lee, Nae-Chan and Han-Young Lie. “Korea’s Telecom Services Reform Through Trade Negotiations,” Chapter 8 in Takatoshi Ito and Anne O. Krueger, p. 244.
A Chronology of Major Reforms

The following chronological review of the Korean government’s evolving telecommunications policy takes all of these factors into account. It shows how, at each historical stage, the policy balance shifted between public and private initiative, monopoly and competition, domestic and foreign ownership, and centralized versus decentralized administration.

Wilson interprets the domestic-foreign balance in telecommunications policy largely in terms of property rights and ownership. Here we broaden that point to include also the foreign influence on South Korea’s telecommunications policy that was exerted by bilateral trade talks with the United States and the WTO agreement on telecommunications.

The 1980s Restructuring – As noted in Chapter 2, the truly revolutionary changes that were needed to restructure telecommunications in Korea began in the 1980s. They included the establishment of KTA and a Telecommunications Policy Bureau within the MOC. The major instruments of telecommunications policy included the authority to:

- Grant licenses to new telecommunications service providers.
- Set guidelines for rates to be charged for telecommunications services.
- Establish regulations governing use of the electromagnetic spectrum.
- Establish guidelines for the sharing of facilities, as in so-called “local loop unbundling.”
- Generally propose laws regarding all aspects of telecommunications service provision.

This considerable policymaking and regulatory authority remained centered within the Ministry of Communications and later the Ministry of Information and Communication until 2008 when it was transferred to the Korea Communications Commission as part of a drastic government restructuring and streamlining.

It was precisely the success of South Korea’s telecommunications policy in the 1980s that brought increased pressure from U.S. trade negotiators who saw a growing and thriving market. In January of 1990, the Bush administration announced that it would not “retaliate” for the trade restrictions of either Korea or the EU, but would instead continue negotiations.

The pressure of these negotiations brought about the first of four major government-driven restructures in the 1990s. The first three of these were closely related with the bilateral negotiations with the United States and the

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multilateral negotiations of the Uruguay Round trade talks. The fourth was a direct response to the 1997 IMF crisis.

The 1990 Reform Package – In January of 1989, just over a year after Korea had completed the PSTN and satisfied nationwide demand for telephone service, the United States designated it as a priority foreign country, under the Omnibus Trade and Competitiveness Act of 1988 with the intent of opening up Korea’s telecommunications services market. The European Union was designated along with Korea for possible sanctions because they restricted imports of telecommunications products. Such a designation raised the possibility that tariffs could be imposed if talks aimed at settling the problem were not successful.

Some members of Congress and the U.S. business community claimed that Korea’s restrictions denied the U.S. billions of dollars in telecommunications exports. The American exports involved included large digital-switching devices, value-added networks that provided such services as message storing and hundreds of other products in which the United States reportedly had a competitive lead. The Korean market was estimated at $1.3 billion in 1985 and was projected to grow to $1.8 billion by 1990. Because of Korean policies that encouraged domestic purchases, the United States recorded practically no sales in South Korea.

Liberalization of the value-added services market was a major agenda item in the Uruguay Round of international trade talks which took place alongside the talks with the U.S. The Korean government, after a series of bilateral talks with the United States, decided to carry out structural reform of its telecommunications market in July of 1990. A key feature of the reform was to divide service providers into three categories, general, specific and value-added, as shown in Table 3.1.

TABLE 3.1 ABOUT HERE

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<table>
<thead>
<tr>
<th>Category</th>
<th>General Service Provider</th>
<th>Specific Service Provider</th>
<th>Value-Added Service Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities</td>
<td>Own Facilities</td>
<td>Own Facilities</td>
<td>Leased facilities</td>
</tr>
<tr>
<td>Subservices</td>
<td>Fixed telephony, telegraph, telegram, private leased circuits</td>
<td>Wireless services: cellular, radio paging, TRS, wireless data transmission</td>
<td>Database, data processing, data accumulation and transmission, EDI, email, CRS registration</td>
</tr>
<tr>
<td>Market Entry Condition</td>
<td>Designation</td>
<td>Licensing</td>
<td>Registration</td>
</tr>
<tr>
<td>Foreign Ownership</td>
<td>Not allowed</td>
<td>Up to 1/3 of the total shares (not allowed to be the largest shareholder)</td>
<td>Up to 100%</td>
</tr>
</tbody>
</table>

Source: Ministry of Information and Communication
General and specific service providers were differentiated from value-added by virtue of having their own facilities. As shown in Table 3.1, each category had different entry requirements and different leeway for foreign ownership. This allowed Korea to resolve the external trade issue by opening the value-added services market and part of the mobile market. The strategy treated foreign entry differently according to the degree of pressure for market opening.\footnote{Lee, Nae-Chan and Han-Young Lie, “Korea’s Telecom Services Reform Through Trade Negotiations,” in Ito, T. and Krueger, A. O. (Eds.), \textit{Trade in Services in the Asia Pacific Region}, 	extit{NBER-East Asia Seminar on Economics}, Vol. II, Chicago, LL; The University of Chicago Press, 243-275}

The major consequence of the 1990 reform was that the Korean government reluctantly introduced competition into the telecommunications field. A duopoly was introduced in international telephony service with DACOM entering the market in 1991. Ten regional paging services and the second cellular mobile service (Sinseg Telecom) entered the market in 1992 and 1994 respectively. Also, value added services were opened to full-blown competition. According to Choi, Byung Il, a member of the Korean delegation to the U.S.-Korea bilateral telecommunications negotiations, Korean bureaucrats thought that complete opening of the value-added services market would have no major impact on the domestic industry because of poor local demand.\footnote{Hyun, Daiwon and John Lent, “Korean telecom policy in global competition: Implications for developing countries,” \textit{Telecommunications Policy}, 23 (1999), p. 393.}

**The 1994 Restructuring** – Prompted by successful conclusion of the Uruguay Round of trade negotiations, this reform removed line of business restrictions, extended the scope of value added services and deregulated the carriers’ business operations. Consequently, DACOM was granted a long distance service license in March 1995 and PCS, TRS and wireless data services were licensed in 1995 and subsequent years.\footnote{Tcha, Dong-Wan, June S. Park, Suk-Gwon Chang and Kwan Ho Song “Korean telecommunication industry in transition,” \textit{Telecommunication Systems} 14 (2000), p. 4.}

**The 1995 Restructuring** – The advent of the WTO and its Negotiating Group on Basic Telecommunications (NGBT) provided a motive for this reform. In 1995, while under continued pressure from the United States, Korea decided to earnestly liberalize its domestic market. Information and Communications Minister Kyong, Sang-hyun said the new policy was designed “to improve the competitive edge of the domestic industry three full years ahead of a full-scale market opening under the new world order of the WTO.”\footnote{Hyun, Daiwon and John Lent, “Korean telecom policy in global competition: Implications for developing countries,” \textit{Telecommunications Policy}, 23 (1999), p. 394.} Actually, the WTO came into being in 1995, as the successor organization to the General Agreement on Tariffs and Trade, which was established in the wake of the
Second World War. The WTO is a membership organization, based in Geneva. In 2009 it had 153 members, accounting for over 97 percent of world trade. The restructuring replaced “proper” competition under the government’s intervention with full-blown competition for most telecommunications services, allowing the market mechanism to work. As a result there were more than 30 new entrants into the market in 1996 and 1997 across a wide range of telecommunications services.\textsuperscript{135}

In December of 1996 another landmark agreement in trade negotiations, the Information Technology Agreement (ITA) was reached in Singapore. At a gathering of 127 nations, 35 countries that accounted for nearly 94 percent of global trade in information technology products signaled that they would back the abolition of import duties by 2000 in the $500 billion per year sector. The accord covered 300 products including computers, software, semiconductors and telecommunications equipment.\textsuperscript{136}

**The IMF Crisis and 1997 Restructuring** – Korea was among the first group of countries in the ITA, demonstrating that by 1996 it was well on the way toward opening up its telecommunications sector. However, the 1997 financial crisis and IMF-directed reforms in South Korea would have an even greater influence on restructuring.

During the autumn of 1997, several of the *chaebol* industrial conglomerates went bankrupt, investors lost confidence in the economy, and capital fled the country. Within just a few days the Korean won lost half of its value, tumbling from 900 to 1900 won to the dollar. The government’s foreign currency reserves dropped to $4 billion, an amount insufficient to carry the country through another day. In December of 1997, barely a year after joining the Organization for Economic Cooperation and Development (OECD), Korea turned to the IMF for economic assistance. That same month, Kim Dae Jung was elected President of South Korea.

South Korea and the IMF agreed to a $58 billion support package. In return, Seoul agreed to tighten its fiscal and monetary policies and to engage in far-reaching, market-oriented reforms of its financial and corporate sectors. By the year 2000, the nationalization program had brought about one-third of the banking industry’s assets into government hands, and state ownership of the banking sector formed the crux of a major trade dispute with the U.S. and the European Union. In the dispute, state-controlled banks were accused of illegally subsidizing Hynix Semiconductor, the world’s third largest producer of DRAM semiconductor chips. However, by the spring of 2004, sales of many formerly


state-owned banks had given foreign companies collectively a major stake in South Korea’s financial sector.  

The 1997 telecommunication reforms introduced a new class of telecommunication service providers called Special Telecommunication Service Providers (STP) for which only a registration with the Ministry of Information and Communications was required for market entry. The STP class consisted of voice resale, internet phone service, international call-back service and premise-network service providers. The Asian financial (or IMF) crisis which began in 1997 led to the privatization of Korea Telecom and the Korean Electric Power Company and broader market access from abroad. Foreigners invested $2 billion in the information and telecommunication industry in 1998, which was 23% of total foreign investment that same year.  

U.S.-Korea Trade Negotiations after the IMF Crisis

Following the financial crisis of 1997, there were several main characteristics of U.S. trade disputes with South Korea.

First, given the disparities in size and economic dependence, it is not surprising that the U.S. typically set the agenda of U.S.-ROK trade talks.

Second, U.S. exporters and trade negotiators identified a “lack of transparency” of Korea’s trading and regulatory systems as the most significant barriers to trade with Korea in almost every major product sector. They complained that Seoul continued to use government regulations to discriminate against foreign firms in politically sensitive industries, such as automobiles and consumer electronics.

Third, a 2004 report noted that telecommunications had recently emerged as one of the most contentious trade issues between the United States and South Korea. Korean government efforts to set mandatory, single technology standards for wireless telecommunications services led the US Trade Representative to name South Korea as a “key country of concern” in its annual report under Section 1377, which requires USTR to assess U.S. trading partner’s compliance with international telecommunications agreements. Specifically, for two years USTR negotiated with the South Korean government over its plan to require all cell phone services to use only the so-called wireless internet platform for interoperability (WIPI) for downloading information from the Internet. The WIPI requirement would have excluded users and developers of other operability platforms, such as the platform developed by Qualcomm, which was used by a leading Korean cellular service provider. In April 2004, Seoul and Washington announced they had reached a compromise that allowed the MIC to implement

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137 Manyin, Mark E. “South Korea-U.S. Economic Relations: Cooperation, Friction and Future Prospects,” CRS Report for Congress, Received through the CRS Web, Updated July 1, 2004, p. 6.

WIPI, but also permitted cellular phones to be made compatible with other standards.

Korea also had several major complaints in its bilateral trade negotiations with the U.S. One of these was against the U.S. use of anti-dumping and countervailing duty (CVD) laws. According to one study, in July 2000 the five CVD and 18 anti-dumping orders against South Korean exports covered approximately $2.5 billion or over 7% of U.S. imports from South Korea in 1999. Moreover, these tariff hikes tended to be concentrated in a handful of Korean industries – semiconductors, steel, televisions, and telecommunications equipment – all of which have considerable political influence in Seoul. By 2004 South Korea had become more assertive in using the WTO to challenge such United States trade practices.¹³⁹

Privatization and Introduction of Competition

The main focus of activity in South Korea’s telecommunications sector in the 1980s was on building the public switched telephone network (PSTN) and extending it throughout the nation to farming and fishing villages until the nation had “one telephone per household.” To implement this policy, Korea’s leadership determined that the public good required private sector initiative. Hence, the government began to privatize telecommunications.

First, in a breakthrough measure, the government established the Korea Telecommunications Authority (later renamed Korea Telecom) in order to separate telecommunications policy from the management of telecoms services. As a result, a telecommunications policy department was established within the MOC and management responsibility for services was given to KTA. KTA was established on January 1, 1982. The government was the sole investor, contributing 2.5 trillion won and a total of 35,225 employees from 153 divisions moved from the MOC to the KTA.¹⁴⁰ This change would be a test of whether telecommunications could be smoothly managed by an organization outside of the supervisory ministry.

KTA started out as a government-owned corporation. Government ownership had been reduced to 59 percent by the end of 2000. However, it would not be until August of 2002 that it would be declared a fully-privatized company. Nevertheless, its creation and separation from the Ministry was the first critical step in the privatization process in South Korea.

¹³⁹ Manyin, Mark E. “South Korea-U.S. Economic Relations: Cooperation, Friction and Future Prospects,” CRS Report for Congress, Received through the CRS Web, Updated July 1, 2004, p. 16.

Table 3.2 shows how the private-public balance in the telecommunications sector began to shift perceptibly toward the private sector. It also shows that market liberalization, or the shift from monopoly to competition began during the 1990s.

TABLE 3.2 ABOUT HERE
Table 3.2: Privatization and Market Liberalization in Korea

<table>
<thead>
<tr>
<th>Privatization</th>
<th>Liberalization</th>
</tr>
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<tbody>
<tr>
<td>Establishment of the KTA (1981)</td>
<td>Gradual introduction of competition in basic telecom services:</td>
</tr>
<tr>
<td>Separation of specialized service operators from KTA</td>
<td>• International (1991)</td>
</tr>
<tr>
<td>• DACOM (1982)</td>
<td>• Mobile (1994) Shinsegi Telecom given second Mobile (CDMA) license</td>
</tr>
<tr>
<td>• Korea Mobile Telecom (1983)</td>
<td>• Long Distance (1995)</td>
</tr>
<tr>
<td>• Korea Port Telephone (1995)</td>
<td>• Local Service (1999)</td>
</tr>
<tr>
<td>Privatization Act (1997)&lt;sup&gt;141&lt;/sup&gt; (Act on improvement and management of</td>
<td>Three PCS operators allowed to enter mobile market (1996)</td>
</tr>
<tr>
<td>public enterprises and privatization)</td>
<td>Resale (1997)</td>
</tr>
<tr>
<td>Full Privatization of KT (2002)</td>
<td>Foreign ownership limit increased to 49% including KT (2001)</td>
</tr>
</tbody>
</table>

Source: Various Korean government documents.

<sup>141</sup> Law 5387 of August 28, 1997 repeals the Korea Telecommunications Corporation Act. Converts the Korea Telecommunications Corporation into a stock company under the Commercial Act as of October 1, 1997, according to the government’s privatization policy for public enterprises; the conversion enables the reduction of government regulation under new management by specialized managers; subject to the newly enacted Act on the Improvement of Management and Privatization of Public Enterprises until its complete privatization. (7 articles; pp.93-95)
While South Korea is often referred to as a case of government-led development, it is probably more accurate to call it development through a government-industry partnership. A 2003 case study of broadband internet in Korea by the ITU noted that “Korea’s high level of ICT adoption is no accident. It is the result of years of government policies, planning and financial support for targeted areas. A high level of cooperation between government and the private sector has assured success.” 142

During the critical years from 1981 through 1988, South Korea’s Ministry of Communications was in the process of separating itself from the telecommunications business through privatization. As a matter of course, there was friction between the Ministry and people in business circles. However, although it required a great deal of work and preparation, the sense of partnership between business and government increased greatly during the 1980s.

In those days the Ministry’s stance was that it would work constructively to help business circles whenever the means were available to do so. Telecommunications development could not be accomplished by the Ministry of Communications alone. Instead, it became possible through a collaborative partnership with the business community and healthy growth of business was an important part of that development. High level officials in the Ministry were known to think that major telecommunications service providers should drastically and even unreasonably cut the price of some of their well-known products and services. Despite this, the Ministry of Communications did not receive criticism from the business community. The ability of government to work closely with the business sector in South Korea stands in stark contrast to the situation in other developing countries where government officials often see business interests as the enemy, rather than a collaborator.

The privatization of Korea Telecom has been studied in depth and provides an illustration of the political and economic factors involved in the privatization process. First announced in 1987, the privatization of KT was finalized only fifteen years later in May of 2002. The plan to privatize KT was announced in response to both international and domestic pressures. Internationally, the U.S. government and later the World Trade Organization and the International Monetary Fund brought the pressure. Domestically the large Korean chaebol were pressuring hard to enter the telecommunications services market.

The major stakeholders in the privatization of Korea Telecom included the Korean government, the large Korean chaebol conglomerates, and international

players. Internationally, the U.S. government, transnational corporations and international organizations had significant roles in the privatization.

The Korean government directly controlled the process of privatization, including the method and timing for selling the government’s share of the company. However, while pushing the telecom market toward privatization, the government wanted to preserve its main role as the regulatory agency over KT because it needed the company in order to implement important telecom policies, such as universal services. The change in Korean government policy, in keeping with the global trend toward market liberalization and privatization, can be dated from about 1994 and the push for Segyehwa by the administration of President Kim Young Sam. The inauguration of the WTO system in 1995 gave added impetus to the privatization process.

In 1994, the Korean government enacted the “Act on Promotion of Private Investment in Infrastructure” and, in 1997, it enacted the “Act on Improvement of Management Structure of Public Enterprises and Privatization (so-called “the Special Act on Public Enterprises”). However, it was the Asian Economic or “IMF” crisis in 1997-98 that brought a great turning point in the Korean government’s efforts at privatization, including that of Korea Telecom and other telecommunications firms.\(^\text{143}\)

The Korean chaebol expressed an interest in entering the telecommunications industry, as suppliers, service providers and equipment manufacturers, beginning in the 1980s. Hyundai, Samsung, LG and Daewoo gained a foothold in the market when they started to produce the TDX electronic switching system. Several of the chaebol groups felt that privatization of KT would give them a great opportunity to invest in the lucrative local phone service business.\(^\text{144}\)

**Major Telecommunications Laws**

Over the time span covered by this book there were literally hundreds of laws and amendments passed in order to provide the appropriate legal basis for promotion of informatization and many other telecommunications policy goals.\(^\text{145}\) For this reason, we present the following description of some of the most important laws. Most of them have been amended many times, in response to the media and technology convergence that we deal with in this book.

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143 “Privatization of Public Enterprises in Korea,” document downloaded from Bae Kim and Lee law firm website, [http://www.baekimlee.com/data/data1_47.pdf](http://www.baekimlee.com/data/data1_47.pdf)


145 This stands in rather stark contrast to the United States, where there were only two major telecommunications acts passed in the twentieth century.
There are four major laws that have traditionally governed the telecommunications industry in South Korea. Each has been amended multiple times.

- The Basic Act on Telecommunications (December 30, 1983) provides the general legal framework for the provision and operation of telecommunications services in Korea. It was first passed on December 30, 1983.
- The Telecommunications Business Act (December 30, 1983) governs operations, regulations, user protection and other related matters in the telecommunications business. For example, this act establishes the requirements that must be met before a company can provide telecommunications services in Korea and specifies the ratio of foreign ownership that is permitted in any service category.
- The Radio Waves Act governs effective management of radio wave resources.
- The Act on Promotion of Utilization of Information and Communications Network (May 12, 1986) aims to promote utilization of information and communications networks, protect the personal information of users, and build a sound information and network environment.146

In addition the following laws were passed.

- The Software Development Promotion Act, (December 4, 1987). The purpose of this law was to provide for building and promoting the software industry in South Korea. The initial version of the law called for the MIC to draft a medium long term plan that would address infrastructure, support for software startup businesses, training of software specialists and other matters relating to the industry.
- The Basic Act on Informatization Promotion (August 4, 1995) (ITU Broadband Korea case study) was followed by numerous laws. Between August of 1995 and April 2001 a total of 154 laws were enacted or amended. That included 79 laws related to informatization of the public sector and 75 laws related to informatization promotion in the private sector.147

In July 2009 passed three media-related bills, including revisions to the Broadcasting Law, the Newspaper Law and the IPTV Law. These were passed some seven months after being first submitted to the National Assembly and were passed by a unilateral vote of the ruling GNP. Opposition to the bills was largely based on concerns that they would allow Korea’s three conservative daily newspapers to gain a greater hold on public opinion by allowing them to enter the broadcast market.148

The Basic Act on National Informatization, May 2009. When the Lee Myung Bak administration took office in February of 2008, MOPAS began revising the Basic Act on Informatization Promotion. The new law, which went into effect in May of 2009, made several major changes in the national informatization framework. First, the level of the Informatization Promotion Committee was upgraded from being under the Prime Minister's office to being under the president. Reflecting this change, its title was also changed to National Informatization Strategy Committee (NISC). Finally, the new structure expanded the participation of the private sector in an effort to establish a governance framework for government-private sector collaboration.

The roles of the new NISC included deliberation on informatization policies, writing the master plan or action plans, designating knowledge information resources, fostering information culture and setting priorities for closing the digital divide. The Committee has an associated CIO Council made up of directors from all relevant ministries, an Executive Committee, and specialized sub-committees of experts. As shown in Table 3.3, it is co-chaired by the Prime Minister and a private sector expert and has 35 members, drawn from the private sector, government, academia and citizens groups.149

TABLE 3.3 ABOUT HERE

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<table>
<thead>
<tr>
<th>Structure</th>
<th>Roles</th>
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<tbody>
<tr>
<td>National Informatization Strategy Committee</td>
<td>[Deliberation] Deliberates on issues related to national informatization promotion</td>
</tr>
<tr>
<td></td>
<td>• Deliberates on master plan and implementation plans on national informatization</td>
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<tr>
<td></td>
<td>• Coordinates national informatization policies</td>
</tr>
<tr>
<td></td>
<td>• Provides feedback on national informatization plans (in terms of budget)</td>
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<tr>
<td></td>
<td>• Designates critical knowledge information resources</td>
</tr>
<tr>
<td></td>
<td>• Deliberates on project plans for closing digital divide</td>
</tr>
<tr>
<td>Executive Committee for National Informatization Strategy</td>
<td>[Preliminary Deliberation] Deliberates on agenda items to be presented to the committee and on agenda items commissioned by the committee</td>
</tr>
<tr>
<td></td>
<td>• Provides support for agenda deliberation as bodies under executive committee</td>
</tr>
<tr>
<td></td>
<td>• Support in fostering information culture, closing digital divide, managing knowledge information resources, etc.</td>
</tr>
<tr>
<td>Subcommittees</td>
<td>[Support for Executive Committee Deliberation]</td>
</tr>
<tr>
<td></td>
<td>• Chair: Appointed by Co-Chairs of Executive Committee</td>
</tr>
<tr>
<td></td>
<td>• Members: Government officials and private sector experts</td>
</tr>
<tr>
<td>Chief Information Officers (CIO) Council</td>
<td>[Coordination]</td>
</tr>
<tr>
<td></td>
<td>• Chair: Minister of MOPAS</td>
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<td></td>
<td>• Members: Directors of ministries</td>
</tr>
<tr>
<td></td>
<td>• E-government policies</td>
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<td></td>
<td>• Administrative information sharing</td>
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<td></td>
<td>• Information Technology architecture</td>
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<tr>
<td></td>
<td>• Information resource management</td>
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<tr>
<td></td>
<td>• Regional informatization.</td>
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</table>
Aspects of Leadership in the Korean Context

What were the key aspects of government-led restructuring of South Korea’s ICT industries over the past three decades? Our treatment of the topic in this chapter highlights several of them.

First, the nature of leadership shifted noticeably away from the heavy-handed government leadership of the developmental state under Park Chung Hee, toward market liberalization and a government-business partnership in the 1980s, and an ever-greater role for the private sector in the 1990s and the early years of the twenty-first century. We might refer to this, following Jho, as the rise of network governance.

In the face of rapid technological change, state authorities around the world began looking at how to shift from top-down government to more decentralized governance mechanisms. These emphasized the use of partnerships and network transactions with global firms as well as the local private sector. This focus on networks and the interdependence of the state and private sector was a central and vital element of governance in Korea from 1980 onward. This development posed a difficulty for adherents of the developmental state concept. Namely, that concept tended to conceptualize the global economy as the context in which local production and innovations take place. However, as Jho notes, the global economy is “…no longer a context for developmental strategies, but rather a constitutive element of them.”

However, some scholars might still propose a statist explanation for Korea’s development. Along with Jho, we reject this. Korea’s shift to new governance in the ICT sector did not evolve as in other countries such as the liberal governance in the U.S. Instead, it transformed into a “…state orchestrated network of institutions and mechanisms in which various interests of the state, local actors and the global economy are represented and coordinated.” The economic governance in Korea was based on a “steering” network that allowed for effective coordination between the state and private actors with connections to global technology and business networks.

It was natural that some of the key leaders of telecommunications policy in the 1980s would come out of the military academy, for that was where the nation’s

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leaders were trained in that era. Along with economic development, the broad political, and social structures of South Korea changed dramatically over the course of three decades. Political liberalization and democratization, with a key turning point in June of 1987, was one key.

Second, the Ministry of Information and Communication, with numerous associated government agencies and research institutes, emerged as the clear leader of South Korea’s telecommunications and informatization policies. This leadership continued to strengthen until the massive government reorganization of early 2008, instituted by the new administration of President Lee Myung Bak. Of course, the political structures in South Korea place the Blue House, Korea’s equivalent of the American White House, at the top of the governmental power hierarchy. The Prime Minister’s office also plays a powerful and important role in government, and as of 1996 it officially took charge of the nation’s efforts to further promote the information society.

A third important aspect of government led restructuring in South Korea over the past three decades is its consistent planning and re-investment. From the days of its early industrial development under President Park Chung Hee, the South Korean government made use of five-year economic plans. However, long term planning alone was not the secret behind the telecommunications revolution. It also had to do with consistent implementation and even strengthening of policy over time. Here, we refer explicitly to the legal requirement that providers of telecommunications services re-invest three percent of their profits into research and development. Without such steady and sustained investment in R&D, it is difficult to imagine the successes of TDX, the semiconductor industry or commercialization of CDMA, in the face of continued global technology change and competition.

Underlying the long-term consistency of Korea’s policies is an approach that stressed consensus-building. For example, on one occasion the MOC delayed a decision for about one year in order to assemble support for it. That was the decision to allow facsimile machines and various electronic devices to freely be connected to the newly-completed PSTN.

A fourth aspect of Korean government’s role in strategic restructuring is promotional leadership. Starting in the 1980s, the whole government, together with the private sector and educational institutions, took on the task of promoting information culture in Korea, a pan-national effort that continues to this day. For example, although some of the key leaders were educated in electrical engineering or related technical fields, they understood the information society from political and economic perspectives as well. They believed fervently that information and communications technology would not only provide convenient services for the public, but would eventually serve as the driving force behind

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economic development. The author of this book, in particular, was also confident that “genuine democratization could be achieved through the modernization of communication and the privatization of information.” His dedication to spreading “information society thought” knew no bounds. Among other things, he lectured on the information society at almost every graduate school in Seoul with a specialty in this field.\(^{153}\)

A fifth element in Korea’s government leadership has to do with technical expertise. Starting in the 1980s the Minister of Communications was no longer a political appointee, but was expected to have technical or professional background in telecommunications. By the same token, the expertise in telecommunications and digital electronics that some of the MOC staff possessed helped increase its stature among government ministries. With the successes of TDX and the 4 MB DRAM, people could see that the nation’s electronics industry had received the breath of new life and was on the verge of a sustained expansion. Consequently, the power and influence of the Ministry of Communications was greatly enhanced. Wilson speaks of “four main gears” – technical, commercial, institutional and political--which together make up an information revolution. As he notes, they can also block a revolution if they are not present, well oiled and closely coordinated.\(^{154}\) The addition of technical expertise to leadership at the MOC helped greatly to facilitate Korea’s digital information revolution.

Finally, a sixth element, although less tangible, may be equally important. The Korean word chollian chosen by DACOM as the name for one of its first internet services, literally translates “the eye that can see a thousand li” with li being a common measure of distance in Korea. However, the real non-literal meaning of the word is clairvoyance. Whether we call it vision or clairvoyance, the ability to imagine the future or look far into the future seems to be a defining characteristic of Korea’s leadership in the information revolution.


Chapter 4: Segyewha and Korea’s Broadband Revolution

The 1990s brought sweeping political, social and economic change to South Korea, along with a new emphasis on segyewha or “globalization.” In 1996 the nation joined the Organization for Economic Cooperation and Development (OECD) a sure sign that it had become one of the world’s advanced economies. However, the decade also included the searing experience of the Asian economic crisis in 1997-98, better known as the “IMF crisis” in Korea.

Over the same time span, Korea experienced two more closely interrelated waves of digital development and innovation, in the form of the broadband and mobile revolutions. Although they are neatly separable only for analytical purposes, this chapter takes up the topic of broadband and the next chapter will deal with developments in mobile communication.

Our goal in this chapter is to describe the broadband internet revolution in South Korea, situating it within the nations’ political, social and economic context as well as relative to global developments. We also seek to identify some of the major factors behind Korea’s broadband revolution, including the manner in which the massive Korea Information Infrastructure (KII) fiber optic networking project from 1995-2005 was built upon technology, expertise and confidence gained in the 1980s. Government and private sector efforts to promote informatization, the popularity of PC Bahngs and continued restructuring of Korea’s telecommunications sector are also part of the story.

South Korea in the 1990s: From Segyewha to IMF Crisis

South Korea elected civilian presidents in 1992 and again in 1997, marking a clear cut change from earlier governments. Longtime opposition leader Kim Young Sam was the first of these and from early on he made segyewha or globalization, the self-styled hallmark, even the litmus test of his administration.

President Kim’s thinking on globalization was expressed in a January 1995 televised speech to the nation: “Fellow citizens: Globalization is the shortcut which will lead us to building a first-class country in the 21st century. This is why I revealed my plan for globalization and the government has concentrated all of its energy in forging ahead with it. It is aimed at realizing globalization in all sectors – politics, foreign affairs, economy, society, education, culture and sports. To this end it is necessary to enhance our viewpoints, way of thinking, system and practices to the world class level … we have no choice other than this.”155

The Kim administration touted globalization not as a matter of choice, but as a necessity. It was either globalize or perish. While the term globalization is interpreted by some as simply economic liberalization, segyewha in Korea was a more comprehensive term embracing political, cultural and social open-

mindedness.\textsuperscript{156} Of course, information and communications technology are a major part of globalization, so the specific initiatives taken by the Kim Young Sam administration should be interpreted in light of its overarching emphasis on \textit{segewha}.

The 1990s began with impressive annual rates of economic growth that continued unabated until the Asian economic crisis struck. The crisis created high levels of unemployment that in turn posed both social and political problems for Korea. The crisis not only affected the outgoing administration of Kim Young Sam, who left office with low public approval ratings, but also shaped policies of the incoming administration. What is most significant for our purposes is the manner in which the nation responded to this crisis. Although economic growth dipped in 1997-98, it resumed its upward trajectory on the strength of a renewed government and private sector commitment to the ICT sector and to the long-term task of building an information society.

In December of 1997, Kim Dae Jung was elected president. In his inaugural speech he made it clear that he, like his predecessor, would push for further development of Korea’s information society. “The world is now advancing from industrial societies where tangible natural resources were the primary factors of economic development into knowledge and information societies where intangible knowledge and information will be the driving power for economic development. The information revolution is transforming the age of many national economies into an age of one world economy, turning the world into a global village.”\textsuperscript{157}

Although the KII plan had begun in 1995, the 1997 economic crisis was a major reason that the government targeted broadband internet as a new opportunity for economic growth. The new government of Kim Dae Jung saw broadband as an axis of development in the new knowledge-based economy. As noted in the previous chapter, it therefore undertook a massive program to provide IT training to millions of citizens, beginning with those who lost their employment in the IMF crisis.\textsuperscript{158}

\textbf{Defining and Measuring broadband Internet}

The term broadband is shorthand for “broad bandwidth.” Bandwidth generally refers to the transmission capacity of an electronic communications device or system. As we use the term “broadband” in this book, it has at least three important dimensions.


\textsuperscript{157} President Kim Dae Jung’s inaugural speech, February 25, 1998.

First, “broadband” refers to the speed of one’s connection to the internet. However, as a recent study notes, speed is only a rough measure of capacity for two reasons. One is that absolute speed, as measured in megabits per second or gigabits, does not necessarily translate into equivalent user experience or value. The second is that governments and policymakers around the world until recently differed widely in their definition of speeds required to qualify as “broadband.”

In the United States, the Federal Communications Commission in 2009 described broadband in terms of speeds ranging “…from as low as 200 kilobits per second (kbps), or 200,000 bits per second, to six megabits per second (Mbps), or 6,000,000 bits per second. Some recent offerings even include 50 to 100 Mbps.” Other organizations around the world define broadband to include what seem like very slow speeds. For example, the OECD’s broadband subscriber criteria specify download speeds of at least 256 Kbits/second. To much of the world today, including virtually all internet users in Korea, such slow speeds are a thing of the past.

Fransman suggests that broadband may be thought of as access to the internet at speeds significantly higher than those used by the traditional method, namely narrowband or dial-up. His analysis identifies the period from 1996 to 2000 as the narrowband era in the evolution of the internet.

A second consideration in using the term “broadband” is availability. A broadband connection to the internet, in contrast to the old dial-up or “narrowband” connections, is always on. As distinct from speed, the always on characteristic of broadband defines a fundamentally different user experience. Broadband, as compared to the dial-up experience that preceded it, is relatively seamlessly integrated into a user’s life, at home, at the office or in the PC Bang. This helps to explain why social networking in Korea via Cyworld preceded Facebook in the U.S. by four years.

In addition to speed and availability per se, a third dimension of broadband internet is greater computing and communications power, which translates into potential value. Robert Metcalf, the inventor of Ethernet, expressed this as a law which states that the power of a telecommunications network increases with the number of connected users of the system. Gilder refers to it as Metcalf’s law of the telecosm showing the magic of interconnections: connect any number “n”

159 Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 16.
161 www.oecd.org
163 Ethernet is today the world’s dominant local area network.
of machines – whether computers, phones or even cars – and you get n-squared potential value.\textsuperscript{164} As the Berkman Center study puts it, broadband internet can be defined in terms of the anticipated applications (and their value) rather than speed or availability alone. Korea’s IT 839 program provided an explicit example of this way of thinking. It was an ambitious plan calling for a network to support eight services, three infrastructures and nine growth engines.\textsuperscript{165}

Associated with the challenge of clearly defining broadband internet is the need to accurately measure it. Measures of broadband internet within and among the countries of the world assume increasing importance as the significance of broadband to economic and social development becomes more widely apparent. The OECD and the ITU were among the first international organizations that attempted to measure and quantify broadband, but over the years, others have joined the effort, as described below.

**The OECD Broadband Portal**

The OECD identified the following five main categories as important in assessing broadband markets around the world.

- Penetration
- Usage
- Coverage
- Prices
- Services and Speeds

On the first measure, that of penetration, the OECD tracks the number of internet subscribers per 100 population. Usage is measured by the percentage of households who have access to broadband internet. To measure coverage, OECD statistics compare population density with broadband penetration. Prices are measured by average broadband monthly price per advertised Mb/second. Finally, the OECD data use average advertised download speeds as a measure of internet service and speed.

**The ITU’s Digital Indices**

The International Telecommunication Union has gone through several stages in developing indices to measure digital development. In 2003 it developed a Digital Access Index which was presented to the first phase of the World Summit on the Information Society. This measure included five categories: infrastructure, affordability, knowledge, quality and actual usage of ICTs. It was calculated for 178 economies and was published once.\textsuperscript{166}

\textsuperscript{164} Gilder, George, Forbes ASAP, September 13, 1993.

\textsuperscript{165} Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 18.

At the 2005 meeting of the World Summit on the Information Society a preliminary version of the digital opportunity index (DOI) was launched, side by side with an ICT Opportunity Index developed with Orbicom. A full version was published in 2006 and an update in 2007. The main purpose of the DOI was to measure country’s potential to benefit from ICTs. It utilized eleven indicators in the three categories of opportunity, infrastructure and utilization.\textsuperscript{167}

The digital opportunity platform was a multi-stakeholder initiative of the ITU, UNCTAD and the Korea Agency for Digital Opportunity and Promotion (KADO), with the support of Korea’s Ministry of Information and Communication.\textsuperscript{168} The index has been compiled for 62 leading economies from 2000 through 2006 and for a larger group of 181 economies from 2004. In recent years South Korea has ranked number one in the world according to the digital opportunity index.

With publication of both the ICT-OI and the DOI, discussions began in 2006 about the utility of having two different indices. The result of these discussions and subsequent work was the creation of a new single index, the ICT-Development Index (IDI). The IDI incorporated elements of the two previous indices and was broken down into three sub-indices: access, use and skills, as shown in Table 4.1.

\begin{table}[h]
\centering
\caption{Table 4.1}
\end{table}


\textsuperscript{168} http://www.itu.int/osg/spu/digitalbridges/platform/index.phtml
<table>
<thead>
<tr>
<th><strong>ICT Access</strong></th>
<th>Reference Value</th>
<th>Percent</th>
<th>Proportion of IDI(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fixed telephone lines per 100 inhabitants</td>
<td>60</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2. Mobile cellular telephone subscriptions per 100 inhabitants</td>
<td>170</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>3. International Internet bandwidth (bit/s) per Internet user</td>
<td>100,000*</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>4. Proportion of households with a computer</td>
<td>100</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>5. Proportion of households with Internet access at home</td>
<td>100</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ICT use</strong></th>
<th>Reference Value</th>
<th>Percent</th>
<th>Proportion of IDI(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Internet users per 100 inhabitants</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>7. Fixed broadband Internet subscribers per 100 inhabitants</td>
<td>60</td>
<td>33</td>
<td>40</td>
</tr>
<tr>
<td>8. Mobile broadband subscriptions per 100 inhabitants</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ICT skills</strong></th>
<th>Reference Value</th>
<th>Percent</th>
<th>Proportion of IDI(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Adult literacy rate</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>10. Secondary gross enrolment ratio</td>
<td>100</td>
<td>33</td>
<td>20</td>
</tr>
<tr>
<td>11. Tertiary gross enrolment ratio</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>
Korea ranked third in the world on the IDI in 2002, following Sweden and Iceland, and second in the world in 2007, following only Sweden. In 2008 South Korea dropped down to third place, mainly because of how the ICT access sub-index was computed. Part of the ITU report dealt with how the limitations of international data affected both Korea and Japan on two measures. First, as of 2008, Korea had a mobile penetration of 95 percent, which placed it relatively low in international comparisons since many other nations, including developing countries, had passed the 100 percent mark. The reason for this is that Korea had very few pre-paid subscriptions, with those generally being reserved for tourists and visitors. Therefore, it was rare to find multiple SIM cards in Korea. Second, South Korea was weak on the “International Internet Bandwidth per User” indicator that was part of the access sub-index. Unlike most other countries, Korean internet users rely mainly on their abundant and relatively low cost national bandwidth. Koreans preferred to surf ‘at home’ on Korean-language websites hosted within the country, not abroad. In fact, as of 2006, the top twenty most popular Korean websites were all hosted in Korea. A similar situation existed in Japan, which had low international bandwidth and a large amount of local content. The ITU report concluded its treatment of this matter as follows. “While including data on international Internet bandwidth penalizes certain countries, such as the Republic of Korea and Japan, it is an essential indicator for measuring ICT-related developments.” The important role of language in shaping the use of the internet and new communication technologies was introduced earlier and will be visited again in Chapter 8.

Finally, we offer a cautionary note about the interpretation of international data. The ITU’s report Measuring the Information Society 2010 notes that Korea “... was one of the first worldwide to adopt mobile broadband third generation technologies and by the end of 2008 the country had over 35 million mobile broadband subscriptions for a population of about 49 million people.” Furthermore, mobile broadband subscriptions forms part of the ICT use sub-index in the IDI. Indeed, a very large proportion of Koreans used 3G CDMA phones long before they became common in other countries. However, what the ITU report neglects to mention is that actual use of the broadband capabilities of these phones for data services remained extremely low in Korea until as late as 2009 because of high data rates and other circumstances, contributing to the great “iPhone Shock” that came at the end of 2009.

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World Economic Forum’s Networked Readiness Index

The World Economic Forum in 2001 began publishing an annual Global Information Technology Report together with INSEAD. That report includes a networked readiness index. In 2002 South Korea ranked 14th in the world, and it then dropped to 20th and 24th over the next two years, returning to rank 14 in 2005 and dropping to 19th in 2006. In the 2007-8 rankings, Korea rose to a score of 5.43 which placed it 9th in the world. In 2008-2009 it dropped to 5.37 and a ranking of 11th in the world.\textsuperscript{172}

The networked readiness framework measures

- the presence of an ICT-friendly and conducive environment, by looking at a number of features of the broad business environment, some regulatory aspects, and the soft and hard infrastructure for ICT;
- the level of ICT readiness and preparation to use ICT of the three main national stakeholders—individuals, the business sector, and the government; and
- the actual use of ICT by the above three stakeholders.

In addition to the above measures and indexes, there are others.

The Economist’s E-readiness Rankings

Since 2000, the Economist Intelligence Unit has assessed the world’s largest economies on the quality of a country’s ICT infrastructure and the ability of its consumers businesses and government to absorb information and communication technology and use it for economic and social benefit. Their report is now called an “e-readiness index.”

The e-readiness index utilizes over 100 separate criteria, quantitative and qualitative. These are evaluated by analysts at the Economist Intelligence Unit in cooperation with the IBM Institute for Business Value and its Center for Economic Development.\textsuperscript{173}

Korea’s e-readiness score in 2008 was 7.81, and it ranked 19th in the world. In 2007 it ranked 16th in the world with a score of 8.08.

The Information Technology and Innovation Foundation (ITIF) Broadband Rankings

Other international organizations have taken issue with some parts of the OECD approach to the measurement of broadband. As noted in a report by the Information Technology & Innovation Foundation (ITIF), one of the principal limitations of the OECD broadband data is that they measure penetration on a

\textsuperscript{172} \url{http://www.weforum.org/en/initiatives/gcp/Global%20Information%20Technology%20Report/index.htm}

\textsuperscript{173} E-Readiness Rankings 2009: The Usage Imperative, A Report by the Economist Intelligence Unit, 2009.
per capita rather than household basis. Also, the OECD does not aggregate broadband penetration, speed and price data into a single composite indicator of national broadband performance. Using data from the OECD surveys, the ITIF developed just such a composite measure. According to this measure, South Korea ranked number one in the world in broadband internet performance, and the United States ranked fifteenth. In the 2008 rankings both countries maintained the same rank. Korea was followed by Japan, Finland, the Netherlands, France, Sweden, Denmark, Iceland, Norway and Switzerland to round out the top ten.

**Oxford, Universididad de Oveido, Cisco Broadband Quality Score**

Other organizations have come up with different ways to assess broadband. In one of the more recent efforts, the Said Business School at the University of Oxford, Universidad de Oveido and Cisco Corporation have developed a broadband quality score. This index combines key performance parameters in order to measure the quality of a broadband connection. A basic premise of this study is that broadband is moving through two waves of development. The current wave, with emphasis on social networking and more use of video, requires greater bandwidth or “quality” and the next wave of ubiquitous networking will require even high speeds and quality.

A broadband quality score is computed using measures of download throughput, upload throughput and latency. Download throughput is the net bit rate of downstream data that transverse the network and the broadband connection. Upload throughput is the net bit rate of upstream data that transverse the network and the broadband connection. Latency is the time taken for a packet of data to travel from source to destination.

South Korea ranked number one in the world in 2009 with a broadband quality score of 65.99. It was followed, in rank order, by the following nine nations: Japan, Hong Kong, Sweden, Switzerland, the Netherlands, Singapore, Luxembourg, Denmark and Norway.

**Where Korea Stands on Multiple Measures**

A recent study by the Berkman Center at Harvard criticized what it called the “horse race approach” to international rankings for two main reasons. First, there has been too much emphasis on one measure, internet penetration per 100 inhabitants. Second, there has been too much emphasis on where particular countries, such as Korea or the United States rank, as opposed to defining a range of metrics that would allow meaningful benchmarking of certain countries in order to learn from their success or failure. Also, we agree with their suggestion that rankings and quantitative analysis must be supplemented by

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qualitative analysis of detailed conditions and practices, along with market, social, geographic, and regulatory-political determinants.\textsuperscript{176}

The Berkman Center study noted that there were two main clusters of international rankings. The first one consisted of the OECD and ITU Rankings. The second cluster included the Connectivity Scorecard created by Leonard Waverman at the University of Calgary, and the Network Readiness Index of the World Economic Forum.

The main difference between these two clusters of international rankings is not their methodological quality, but rather their focus. Namely, the OECD and ITU measures are focused on internet, broadband and telecommunications specific measures of performance. They look at specific, measurable outcomes in terms of population-wide broadband availability, use, capacity and price.\textsuperscript{177} By contrast, the WEF network readiness index and the Waverman connectivity scorecard capture a wide set of indicators, addressing a broader range of concerns, not only in science and technology, but especially in the business environment. The Berkman Center study notes that “If one is interested more specifically in broadband policy—understood as policy aimed at supporting ubiquitous high capacity access to all Americans at affordable rates—the measures that influence standing in this (WEF) index sweep too broadly to provide meaningful guidance.”\textsuperscript{178} Waverman’s study noted that, although the U.S. ranked lower than many other countries, it had benefited more from ICT than most nations. To the extent that one is concerned with business use of ICT, the WEF and Waverman research show that the U.S. is in good condition. However, if the concern is with wide dispersion of broadband to consumers, including underserved areas of a nation, and the provision of ubiquitous access, these two studies provide less insight, and where they do cover similar ground, do not contradict the OECD or ITU data.\textsuperscript{179}

In addition to exclusive reliance on a single measure, another common critique of the OECD penetration rankings is that population density affects the ranking, giving an advantage to such countries as South Korea. OECD data include a comparison of internet penetration to the percent of a nation’s landmass occupied by 50 percent of the population. Not surprisingly only Iceland scores

\textsuperscript{176} Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 26.

\textsuperscript{177} Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 27.

\textsuperscript{178} Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 28.

\textsuperscript{179} Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 28.
higher on this measure of population density than Korea. However, the Berkman Center conducted several quantitative tests that tended to disprove this criticism. Their tests determined that, in each case, countries like Korea, the Netherlands and the Nordic countries outperformed what their level of urban concentration would predict.\footnote{Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 36.}

The Berkman Center study concluded its analysis of internet penetration by noting that with a combination of measures, it is possible to identify some models for observation and learning. These measures included household penetration, to emphasize the importance of home access to policy; per 100 inhabitants, to capture some small and medium enterprise use; mobile, and to some extent nomadic access. They concluded as shown in Table 4.2 that South Korea was a leading performer across all measures: leading household penetration, second on 3G, in the top quintile for per 100 inhabitants, and 7th for Wi-Fi Hotspots. Japan had lower results on per 100 inhabitants and was very low on hotspots.\footnote{Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 45.}

\textbf{INSERT TABLE 4.2 ABOUT HERE}
Table 3.2. Country rankings on various penetration measures.

<table>
<thead>
<tr>
<th>Country</th>
<th>Penetration per 100, OECD</th>
<th>Household penetration, OECD</th>
<th>3G penetration, GC</th>
<th>WI-FI hotspots per 100000, Jwire</th>
<th>Weighted average ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 South Korea</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>3.15</td>
</tr>
<tr>
<td>2 Iceland</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td>27</td>
<td>5.85</td>
</tr>
<tr>
<td>3 Sweden</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>6.1</td>
</tr>
<tr>
<td>4 Denmark</td>
<td>1</td>
<td>4</td>
<td>18</td>
<td>10</td>
<td>8.05</td>
</tr>
<tr>
<td>5 Finland</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>15</td>
<td>9.05</td>
</tr>
<tr>
<td>6 Japan</td>
<td>17</td>
<td>5</td>
<td>1</td>
<td>20</td>
<td>9.2</td>
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<tr>
<td>7 Luxembourg</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>12</td>
<td>9.65</td>
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<tr>
<td>8 Norway</td>
<td>3</td>
<td>6</td>
<td>17</td>
<td>19</td>
<td>9.85</td>
</tr>
<tr>
<td>9 United Kingdom</td>
<td>11</td>
<td>11</td>
<td>10</td>
<td>3</td>
<td>9.9</td>
</tr>
<tr>
<td>10 Switzerland</td>
<td>4</td>
<td>13</td>
<td>15</td>
<td>2</td>
<td>10.25</td>
</tr>
<tr>
<td>11 Netherlands</td>
<td>2</td>
<td>3</td>
<td>25</td>
<td>13</td>
<td>10.35</td>
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<tr>
<td>12 Australia</td>
<td>16</td>
<td>17</td>
<td>3</td>
<td>17</td>
<td>12.55</td>
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<tr>
<td>13 Belgium</td>
<td>12</td>
<td>12</td>
<td>20</td>
<td>8</td>
<td>14</td>
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<tr>
<td>14 Germany</td>
<td>14</td>
<td>15</td>
<td>13</td>
<td>14</td>
<td>14.05</td>
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<tr>
<td>15 France</td>
<td>13</td>
<td>18</td>
<td>14</td>
<td>4</td>
<td>14.15</td>
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<tr>
<td>16 Canada</td>
<td>10</td>
<td>8</td>
<td>26</td>
<td>20</td>
<td>15.1</td>
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<tr>
<td>17 United States</td>
<td>15</td>
<td>14</td>
<td>19</td>
<td>9</td>
<td>15.25</td>
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<tr>
<td>18 Spain</td>
<td>20</td>
<td>19</td>
<td>7</td>
<td>16</td>
<td>15.35</td>
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<tr>
<td>19 Austria</td>
<td>19</td>
<td>16</td>
<td>12</td>
<td>18</td>
<td>15.75</td>
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<tr>
<td>20 New Zealand</td>
<td>18</td>
<td>20</td>
<td>11</td>
<td>11</td>
<td>15.9</td>
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<tr>
<td>21 Italy</td>
<td>22</td>
<td>27</td>
<td>5</td>
<td>21</td>
<td>18.55</td>
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<tr>
<td>22 Ireland</td>
<td>21</td>
<td>22</td>
<td>22</td>
<td>5</td>
<td>20.05</td>
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<td>23 Portugal</td>
<td>25</td>
<td>23</td>
<td>23</td>
<td>6</td>
<td>21.8</td>
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<tr>
<td>24 Slovak Republic</td>
<td>27</td>
<td>26</td>
<td>16</td>
<td>25</td>
<td>23.15</td>
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<tr>
<td>25 Hungary</td>
<td>24</td>
<td>21</td>
<td>27</td>
<td>24</td>
<td>23.85</td>
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<tr>
<td>26 Czech Republic</td>
<td>23</td>
<td>25</td>
<td>24</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>27 Greece</td>
<td>26</td>
<td>28</td>
<td>21</td>
<td>22</td>
<td>24.8</td>
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<tr>
<td>28 Poland</td>
<td>28</td>
<td>24</td>
<td>28</td>
<td>28</td>
<td>26.6</td>
</tr>
<tr>
<td>29 Mexico</td>
<td>30</td>
<td>29</td>
<td>29</td>
<td>26</td>
<td>28.95</td>
</tr>
<tr>
<td>30 Turkey</td>
<td>29</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>29.75</td>
</tr>
</tbody>
</table>

Above to be Table 4.2, perhaps with only top 20.
The Berkman study also looked at several measures of speed (what it calls capacity). These included latency, average advertised download speed, and the results of multiple actual speed tests. Latency is the measure of the degree to which a packet of data is likely to be delayed in arriving. In some applications, such as e-mail, it is irrelevant. However, in others, including VOIP, it is very important.\textsuperscript{182}

Based on their combined measures of internet speed, Japan ranked number one and Korea a close second, ahead of the Netherlands, several Nordic countries and France. Here note that Akamai’s quarterly \textit{State of the Internet} reports, based on data from its servers worldwide, has consistently ranked Korea number one in the world in terms of average connection speeds, with Japan in second place. For the fourth quarter of 2009, Akamai reported that Korea had an average connection speed of 11.7 Mbps, followed by Hong Kong with 8.6 Mbps and Japan with 7.6 Mbps.\textsuperscript{183}

Finally, the Berkman study looked at measures of the price of broadband internet. The measurement of price for purposes of international comparisons presented a more complex challenge because it needed to be measured at different levels of speed. Korea came in 9\textsuperscript{th} in the world on this measure. In the final aggregate rankings that combined penetration, capacity and price, Korea came in fourth, behind Japan, Sweden and Denmark, in that order.\textsuperscript{184}

\textbf{The Diffusion of Broadband Worldwide and in Korea}

In order to place Korea’s experience in the global context, we look back at the invention of the World Wide Web, and the arrival of the broadband internet era, beginning with global developments and then describing Korea’s experience.

\textit{The Arrival of the World Wide Web and the Internet Era}

Searching for information on the internet, use of e-mail and interaction through social networking sites are so commonplace today that it is easy to lose historical perspective. In fact, the worldwide web only recently turned twenty years old, having been proposed in a 1989 research paper by Tim Berners-Lee. It is well to remember that Korea’s telecommunications revolution of the 1980s, culminating in the highly successful Seoul Olympics, all took place in the pre-internet era!

\textsuperscript{182} \textit{Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world}. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 47.
\textsuperscript{183} \textit{The State of the Internet}, Volume 2, No. 4, Fourth Quarter 2009 Akamai, p. 11. \url{http://www.akamai.com/stateoftheinternet/}
\textsuperscript{184} \textit{Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world}. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 68.
Although the structure of the World Wide Web was proposed in the late 1980s, its full impact was not widely understood until the mid 1990s. The first web browser, Netscape, was only released in 1994. As of 1995 Netscape Navigator was the dominant web browser in use around the world, but by the year 2000, Microsoft’s Internet Explorer had captured 80 percent of the market.

In 1994 U.S. Vice President Al Gore gave his UCLA speech calling for the construction of information superhighways. On May 26, 1995, Gates sent his now-famous memorandum to Microsoft executives based on the increased speed and computing power of the internet, what we’ve been discussing as broadband. The subject heading of the memo was the “Internet Tidal Wave.” The first paragraph stated that “Our vision for the last 20 years can be summarized in a succinct way. We saw that exponential improvements in computer capabilities would make great software quite valuable. Our response was to build an organization to deliver the best software products. In the next 20 years the improvement in computer power will be outpaced by the exponential improvements in communications networks. The combination of these elements will have a fundamental impact on work, learning and play.” The memo went on to describe Netscape with its Netscape Navigator as a "new competitor 'born' on the Internet." The memo outlined Microsoft’s failure to grasp the importance of the internet, and in it Gates assigned “the Internet this highest level of importance” from then on.185 Gates memo received scant public notice at the time, least of all in South Korea, which well on its way to becoming heavily dependent on Microsoft software for its computing needs, what many would later label a “Microsoft monoculture.” Even more significantly, the memo was sent before the formation of Google, which only got started in January of 1996.

By the mid 1990s, searching for information by looking for key words among the mounting number of pages on the internet was returning more and more irrelevant content. The founders of Google came up with a big insight to help solve this problem. In 1996 Larry Page was a Ph.D. student at Stanford University in search of a dissertation theme. He considered, among other things, exploring the mathematical properties of the World Wide Web understanding its link structure as a huge graph. His supervisor encouraged that idea so Page focused on the problem of finding out which web pages link to a given page. He had the role of citations in academic publishing in mind and thought that the number and nature of such back links to be valuable information about any given page. He was soon joined in the research by Sergei Brin, a fellow Stanford Ph.D. student and his web crawler began exploring the web in March 1996, setting out from Page’s own Stanford home page as its only starting point. To convert the back link data that it gathered into a measure of importance for a given web page, Brin and Page developed the PageRank algorithm.

Convinced that the pages with the most links to them from other highly relevant Web pages must be the most relevant pages associated with the search, Page and Brin tested their thesis as part of their studies, and laid the foundation for

their search engine. The domain name google.com was registered on September 15, 1997 and they formally incorporated their company, Google, Inc. on September 4, 1998 at a friend’s garage in Menlo Park, California.

Eventually, Google’s success gave a major boost to so-called “cloud computing.” Most simply, cloud computing is internet-based (“cloud”) development and use of computer technology. The cloud is a metaphor for the internet, based on how it is depicted in computer network diagrams and is an abstraction for the complex infrastructure it conceals.\(^{186}\)

According to the founder of the worldwide web, Google’s success shows that the Web needs to be understood and that it needs to be engineered. “The web is an infrastructure of languages and protocols—a piece of engineering. The philosophy of content linking underlies the emergent properties, however. Some of these properties are desirable and therefore should be engineered in. For example, ensuring that any page can link to any other page makes the Web powerful both locally and globally.”\(^{187}\) On the other hand, other properties should be engineered out—such as the ability to build a site with thousands of artificial links generated by software robots for the sole intention of improving that site’s search rankings—so called link farms.

**The Origins and Growth of the Internet in Korea**

Prior to the 1990s, the internet in South Korea, as in other countries, consisted of small-scale experiments by scientists and engineers. These developments were not widely known to the public. Korea’s first Internet system was called the System Development Network (SDN) and connected computers at Seoul National University, the Korea Institute of Electronics Technology and the Korea Advanced Institute of Science and Technology (KAIST) in the early 1980s using TCP/IP protocols.\(^{188}\)

In May 1984, DACOM began its commercial e-mail service through DACOM-net. A series of other critical events occurred in the mid-1980s that allowed Korea to meaningfully participate in the global Internet. In July 1986, the first IP address (128.134.0.0) for Korea was assigned. In 1986, rules for second and third level domains under the .kr domain were established and the country code top level domain to represent Korea, .kr, was formally put in operation.\(^{189}\)

In 1992, the Korea Network Information Center was established in order to provide a network information management within South Korea. Up to that point,


\(^{188}\) Chon, Kilnam Hyunje Park, Kyungran Kang, and Youngeum Lee, *A Brief History of the Internet in Korea*, n.d.

\(^{189}\) Chon, Kilnam Hyunje Park, Kyungran Kang, and Youngeum Lee, *A Brief History of the Internet in Korea*, n.d.
the registration of domain names on the Internet and administration of network information had been performed on an individual network basis. However, because of tremendous growth in domestic Internet use and because there was a global trend for establishing network information centers within continents and individual nations, the Korea Network Information Center was founded.

As already noted, establishment of the World Wide Web completely transformed the internet. In Korea the first web site, cair.kaist.ac.kr, was set up and operated at the Center for Artificial Intelligence Research (CAIR) at KAIST in 1993.190

South Korea adopted broadband internet on a massive scale earlier than any other nation on earth. To place Korea’s broadband diffusion within the larger global context, Figure 4.1 shows Korea’s performance next to two historical OECD leaders in broadband internet penetration. Although based on penetration, a measure of subscribers per 100 population, rather than usage the two measures together show the overall pattern. Korea moved ahead of other nations in the world in both internet penetration and usage levels before the start of the new century. It held that lead until 2005, when several European countries, led by Denmark and the Netherlands overtook it.

INSERT FIGURE 4.1 ABOUT HERE

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190 Chon, Kilnam Hyunje Park, Kyungran Kang, and Youngeum Lee, A Brief History of the Internet in Korea, n.d.
For Korean broadband penetration, the classic “S” curve that characterizes the diffusion of innovations nears its peak and begins to level out before a few other countries caught up. By 2002, as noted in an ITU report, Korea had emerged as a world leader in terms of fixed line telephone subscribers per 100 population, internet users per 100 population, internet penetration, and broadband penetration.\(^{191}\) By 2004 a U.S. Hazlett noted that 78 percent of Korean households subscribed to broadband, twice the percentage in the United States. Furthermore, by that point in time “…the apartment dweller in Korea enjoys the same level of internet service as the largest corporate customers in the U.S. All this in a country of 48 million which, in 1979, had just 240,000 phone subscribers.”\(^{192}\)

On the measure of price, in an October 2007 comparison by the OECD, Korea had the fifth least expensive prices, measured by average broadband monthly price per advertised Mb/second. In US $ PPP, Korea’s figure was $5.96, compared with lower figures in the United Kingdom, Italy, France and Japan which had the least expensive service at $3.09. The same survey put the U.S. price at $12.60 and prices ranged up to 29.30 in Greece, and orders of magnitude higher amounts in Mexico and Turkey.

**Building Korea’s Information Superhighways**

Former U.S. Vice President Al Gore is well known for his advocacy of the internet and in particular a 1994 speech at UCLA in which he called attention to the need for “information superhighways.” South Korea has now become well known as the first country in the world to actually build those superhighways.

The global telecoms industry started to move from copper to fiber optics in 1993 and fiber took off in 1994. Many countries, including the USA and EU nations, used pure government funding and academic institutions to create and pilot fiber networks to test the technology. The Korean government, by contrast, decided that a fiber ATM backbone running nationally was essential for economic development. It therefore supported a pilot project on a national scale, for its own usage as the first customer, with US $1 billion in grants. Private companies built the backbone, and their first task was to connect all government offices. Using such an approach, the government eliminated the start-up risk which private industry would not be able to fund.\(^{193}\) Korea’s answer to the ideas advocated by Gore was formally announced as the Korea Information Infrastructure (KII) plan in March of 1995. The purpose of the KII plan was to build an information superhighway that would provide advanced IT services to

\(^{191}\) Broadband Korea: Internet Case Study, ITU, March 2003, report prepared by Tim Kelly, Vanessa Gray and Michael Minges.


the public and promote informatization in every sector of society. Even more specifically and ambitiously, its purpose was to “...provide various multimedia communications anywhere, anytime and to anyone, and also to turn South Korea into one of the top ten advanced countries in the IT industry by the year 2002.”

Several factors explain why the KII project marked a big advance over the networking projects of the 1980s. First, it involved a massive government-industry partnership, with the private sector playing the major role. Second, it came just as the internet and the World Wide Web were becoming available globally. Third, it would provide state-of-the-art infrastructure for broadband internet approximately 4-5 years before most of the other advanced economies in the world. As one study noted, the KII project “... might have been the most prominent example worldwide for governmental activities in furthering broadband deployment.”

The original goal of the KII project was to construct a high speed and high-capacity “information superhighway” by the year 2015. As it turned out, the project was an unqualified success and achieved all of its original goals by 2005, years ahead of schedule. There were two major reasons for early completion of the KII project. The first was continued technological improvements in switching, which will be discussed in our outline of the project. The second was the enthusiastic response of the private sector and competition in a race to build out the public portion of the information superhighway. The KII project was divided into two parts. The government portion was called New Korea Net-Government (NKN-G) and the public portion New Korea Net-Public (NKN-P).

**Government-Led Competition in Broadband**

The Korean government did not have a single master plan for the introduction of broadband. However, its policies strongly shaped service providers and their strategies and the government was able to foster “facilities-based” competition. The KII project provided a variety of backbone-building and R&D facilitation programs. MIC also offered financial support, granted preferential tax treatment to participants and directly underwrote loans to service providers building their networks.

President Kim Young Sam’s administration had initiated the KII project and greatly strengthened the nation’s informatization program. His successor Kim Dae Jung announced in his inaugural speech the national vision of transforming Korea to a Knowledge and Information Society based on digital equality. The new Minister of Information and Communications picked up on this theme by emphasizing informatization of Korean society. He recognized the importance of

constructing a broadband local access network, based on the success to that date of the Korean Information Infrastructure-Government (KII-G) project. Officials at the MIC, in collaboration with ETRI, at that time identified three alternative technologies for broadband service: ISDN, cable modem and ADSL.\textsuperscript{197}

To choose from among these three alternatives, MIC officials applied three criteria: the possibility of export, bandwidth and investment costs. ISDN and cable modem were not good candidates for export because they were already commercialized in advanced countries. ISDN was limited in speed compared to the other two alternatives. However, Korea Telecom had introduced ISDN in 1993 to cope with an explosive increase in demand for data communications and had developed a corporate commitment to it.\textsuperscript{198} The required investment cost was about the same for all three technologies. Consequently, the Ministry chose ADSL as the best alternative technology.

However, in the wake of the IMF crisis in 1997, the Ministry knew that there was little possibility of securing a large government budget. So it concentrated instead on initiating dialogue with the private sector to induce a commitment to ADSL.\textsuperscript{199}

Hanaro decided to import ADSL equipment from Alcatel, located in Belgium. Local equipment providers including LG and Samsung Electronics had tested ADSL equipment at the laboratory level and were positive about the MIC’s vision for ADSL service, but they thought the market was not ripe for committing their resources as of the 1997-98 time period. Given the difficult financial situation at the time, the MIC provided R&D funds to the providers. The Ministry speculated that if the chip sets could be produced domestically, their price would decline and it would then be possible for ISPs to provide Internet service at an affordable price. The MIC provided matching funds to Samsung Electronics, which had already begun development of universal ADSL chip sets.\textsuperscript{200}

In the wake of the IMF crisis, issues of pricing and demand forecasting for ADSL service proved to be a huge challenge. Estimates by KISDI, KT and the National Computerization Agency diverged widely. There was fundamental disagreement about how demand for ADSL service might develop. At this time there was a heated confrontation between the MIC and ISPs about the appropriate ADSL service fee. The MIC initially proposed a fee between US $40 and US $55 per month, with a potential market size of 2 million subscribers by 2002. This was


later revised to US $27 given the estimated GDP per capita in 2002. In this confrontation the MIC did not compromise. Instead, it offered a series of very attractive, low-interest loans to the ISPs in (US $65 million at 6.5% in 1999 and 7.25% in 2000) and approximately U.S. $100 million at 6% in 2001. While KT could afford to do business without this preferential loan, Hanaro benefited significantly, using it to install optical cables in 4,700 high-rise apartment complexes.\(^{201}\)

The MIC also decided to push its informatization goal with demand-side policies. The government made computer education in schools mandatory and in October of 1998 proposed testing of computer skills for the college entrance exams as part of the Korean Scholastic Aptitude Test. From that point onward, all schools in Korea began designing curricula for computer education programs and preparing computer classrooms. The government also provided educational opportunities for adult citizens by establishing the “General Plan for Citizen Informatization Education” in March 1999.\(^{202}\)

In July of 1998, when disagreements about the proper level of service fees were still being aired, Thrunet suddenly volunteered to deploy broadband service at US $25 per month using cable modems. The consortium realized that the MICs backing of ADSL was a threat and so it decided to enter the emerging broadband market in advance of KT and Hanaro Telecom. Thrunet had been created after it was announced that the government would license one firm to lease out cable infrastructure. Of the 100 or so companies that joined the Thrunet consortium, the largest shareholder was KEPCO (Korea Electric Power Company), the state-owned energy company. When Thrunet commenced services it leased additional capacity from KEPCO.

As early as 1980, KEPCO had installed fiber throughout its network, gambling that once it had the infrastructure, the government would be forced to allow KEPCO to use it more productively. This was interesting, given that KEPCO was fully government-owned and under the jurisdiction of the Ministry of Commerce and Industry (MCI). At the same time, KT had created its own fiber networks with government support, partly financial. A dispute ensued when both KEPCO and KT applied for a license to lease fiber to telecom carriers. Purely from a capacity standpoint, KT’s infrastructure was sufficient, while KEPCO’s was redundant. This situation pitted the MCI against the Ministry of Information and Communications, but they could not engage in a public battle because that would have revealed that MCI had allowed KEPCO to take matters into its own hands with taxpayer’s money.\(^{203}\)


To further strengthen demand for ADSL, the MIC initiated a building certification system for broadband internet. It certified three classes of buildings depending upon the internet connection speed. This allowed construction firms to advertise that their buildings had access to state-of-the-art broadband internet.

The MIC also moved to reduce prices of personal computers, recognizing that they served as the primary terminal for broadband internet at that time. The Ministry approached several medium-sized PC manufacturers to form a consortium and supply Pentium II class PCs at a price below US $667. It also offered 3-year financing to help consumers of the consortium’s PCs, which were called “People’s PCs.”

Given the competition from Thrunet, Hanaro Telecom could no longer delay entering the market. Its entrance is often considered the start of South Korea’s broadband explosion. Hanaro was formed in 1997 after the MIC had announced a year earlier that it would license exactly one competitor in the local telephony market. However, on commencing local telephony services, Hanaro quickly found that it was like David against the Goliath, KT. In an effort to compete, Hanaro began offering DSL services. In April 1999 the company commenced broadband service, offering both DSL and cable, leasing cable capacity from Powercomm, a subsidiary of KEPCO and KT. It matched Thrunet’s price of $25 per month. Furthermore, Hanaro bundled broadband with its basic telephone service and offered free installation, at only about $40 per month. With such aggressive pricing, it acquired more than a million subscribers within 18 months.

At about this same time, Star Craft became immensely popular among middle and high school students, who came home late at night after playing the game in PC bangs. Hanaro Telecom picked up on this phenomenon and focused its advertising on the fact that with its ADSL service, they could play the game at home. This appeal to parents was so successful that the waiting list for Hanaro Telecom’s ADSL service reached 500,000 and stayed at that level for a long time.

Later in 1999, KT entered the ADSL market on a limited scale and Korean equipment manufacturers began producing ADSL equipment. However, it was a full year before KT launched its own full-scale ADSL-based internet service. At that point it realized that ADSL, rather than ISDN, represented the future for broadband internet service in Korea.

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The Government Part of the KII Project

The goal of the government portion of the KII project was to connect government and public facilities, such as educational and research institutions in a fiber optic, atm-switched network, as illustrated in Figure 4.2. The National Computerization Agency (now the National Information Society Agency) was designated as the lead agency and Korea Telecom and DACOM were designated as the companies to provide the NKN-G networks.

The NKN-G portion of the KII project would provide a suitable network platform for certain e-government and public functions, but would itself have fallen far short of the goal of universal service to private residences, including the familiar high-rise apartments in urban areas and the houses in small rural villages and mountainous areas. Note the tenor of the following objectives of the information society, as stated by the government:

- To make an efficient government with improved services for the public through electronic data interchange and joint use of information.
- To use internet and remote learning as a new educational tool, and enable all Koreans to access academic and research information from within the country and from the world at large;
- To promote electronic commerce and increase the provision of start-up and corporate information for stronger industrial competitiveness;
- To spread access to information services across the nation so that people in regional areas benefit from it equally.
- To create pleasant living conditions by improving medical services, the environment, and safety management.\(^{205}\)

By the year 2000 high capacity and high speed optical transmission networks had been extended to 144 regions around Korea and high speed internet and multimedia services were being provided at a low cost. Through government direction, Korea had built what it could call “the world’s best broadband infrastructure.” By December of 2001, 7.8 million people subscribed to high speed internet services and 56.6% of the population used the internet—a world leading rate of usage.\(^{206}\)

Between the start of the project and 2000 51.2 billion won was invested in testing and developing next generation network technologies, required equipment and application services.\(^{207}\)

A key point made in the ITU’s *Broadband Korea* report is that “The rapid take-up of broadband has radically altered conventional network thinking and evolution.” Faced with intense competition from broadband service providers, KT abandoned ISDN as its strategy for data communications over circuit-switched networks, moving instead to ADSL.\(^{208}\)

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\(^{208}\) *Broadband Korea: Internet Case Study*, ITU, March 2003, report prepared by Tim Kelly, Vanessa Gray and Michael Minges.
The Public Segment of the KII Project

The goal of the NKN-P public portion of the NII project was to provide an interactive, broadband and digital multimedia information service to users in the private sector by wiring offices and homes with fiber-optic cables. It was originally intended for completion in 2015. “By launching the multi-dimensional information superhighway that also encompasses satellite and undersea fiber-optic cables, the nation aims to place itself at the center of international telecoms in the coming information society.”

One of the real success factors in the project was that the companies who built the fiber networks, principally KT and DACOM, manufactured two to three times as much fiber as required by the government-network plan, and began to compete with themselves to lay fiber to private businesses and residences. The backbone sections of the national network were made available by the government to KT and DACOM for interconnection with their private fiber networks. But essentially the role of the government was to invest in a high-speed public and government network while encouraging competition to extend that network out to private households and businesses, rather than one of directly subsidizing the entire network.

The KII project included a variety of pilot projects, the aim of which was to prove the value of the network by demonstrating the difference the information superhighway would make to people’s lives. These pilot projects included, among others remote medical treatment, remote primary school education, remote agricultural technical instruction, teleconferencing between central administrative agencies and a pilot tele-court project.

From 1995 to 2003, Korea’s government made seed money investments of KRW 750 billion to induce a total investment of KRW 20.5 trillion including KRW 19.8 trillion from the private sector. By 2000, the laying of fiber optic networks connecting 144 localities nationwide was completed, and 1,400 rural areas had access to broadband networks.

These investments made broadband information and communication services available to 30,000 public agencies, 10,000 schools and 11.18 million households. Internationally, with the dawn of a new century, Korea began to receive more attention as the OECD, ITU and the international media singled-out Korea as a highly successful instance of building a broadband network.


\[211\] Informatization White Paper 1996, National Computerization Agency, Republic of Korea, p. 16

\[212\] 2004 Broadband IT Korea Informatization White Paper, National Computerization Agency, p. 27.
**Advancing Network and Switching Technologies**

New network and switching technologies continued to rapidly evolve while the KII project was underway. In 1992 with the experience gained in the development of TDX switching systems, ETRI began developing asynchronous transfer mode (ATM) switching systems. The ATM system development program was a major aspect of the broadband ISDN program carried out as part of the nationwide technology promotion program.

The Highly Advanced National/B-ISDN project which was completed in the late 1990s utilized ATM switching and became the next link in ATMs large scale commercial switching system. Such a system was planned to provide a central switching node for the infra-network in Korea’s information superhighway of the 21st century, in which digital media would play much different and important roles.\(^{213}\) It was intended to become the core means of providing new working, shopping, and leisure environments.

One of the major challenges faced in the KII project was that, as more advanced services emerge in the telecommunications market, demands change accordingly. In particular, as the project got underway, demand for fixed line telephone services was almost saturated while demand for high speed internet services was getting ready to take off.

Because of these dramatic changes in demand, the government prepared a staged strategy so that KII-G could accommodate more convenient high-speed internet services. This included temporary reliance on an overlay network, with the eventual goal of having all traffic on the integrated network. In the first phase, an ATM Permanent Virtual Circuit (PVC) connects routers. In the second phase, by the year 2000, both the ATM backbone network and router network would be integrated using IP over ATM (IPOA) services. For the third and final phase, after 2001, an integrated network based on ATM with Multi-Protocol Label Switching MPLS was planned.\(^{214}\)

**Demand Magnification: Government-Led Promotion of Informatization**

Citizen education and public promotion of the information society was a major element in Korea’s telecommunications revolution of the 1980s.\(^{215}\) These promotional efforts helped to ensure that there would be sufficient demand for services on the new information highways. In fact, one study of the introduction

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\(^{213}\) Switch is On: Korea, p. 29.


of broadband in South Korea refers to these as “demand magnification” programs.\textsuperscript{216}

When the KII project was started in 1995, the nation required a strengthened legal basis for its drive to create an information society. This was created by a sweeping new law, the Basic Act on Informatization Promotion (BAIP). Informatization is a term that originated in a French publication about the information society by Simon Nora and Alain Minc\textsuperscript{217} and refers to the spread of information use into each social sector, as a result of the evolution of information and communication technology (ICT).

With the passage of the BAIP, the government declared that its long term objective was to achieve an information society to a substantive degree by the year 2010, and to become an advanced nation in the twenty first century.\textsuperscript{218}

In May of 1996, at a meeting of the Presidential Council on Science and Technology, President Kim Young Sam declared informatization a top national priority. A Korea Informatization Promotion Committee embracing the entire government apparatus was set up, to be headed by the Prime Minister, and a new post of presidential secretary with responsibilities for informatization was created for the oversight of information-related matters at the Blue House.

Passage of the Basic Act on Informatization Promotion in 1995 was a significant milestone, in particular because it stipulated the drafting of specific measures and the setting-up of an organizational structure for their implementation. The act was composed of seven chapters, 20 articles and supplementary provisions. Taken together, they made it very clear that informatization would from that time forth be a top national priority.

- National and local autonomous governments were to be actively involved.
- The promotion of informatization and info-communications industries would henceforth be given top priority in implementing plans for specific measures and in allocating budgets.
- An informatization promotion committee was established at the interministerial level as the top policymaking body for resolving and deliberating key issues and policies concerning the promotion of informatization. Headed by the Prime Minister, the committee included the most relevant ministers, representatives from the National Assembly, and the Court Administration.


• An Informatization Promotion Fund was set up to foster information-communication related enterprises, promote informatization, and implement information infrastructure projects (KII).  

Beginning in June 2001, ten government agencies including the Ministry of Information and Communication co-founded the “Internet Education for 10 Million Citizens (2000-2002) which was targeted at the information-alienated class including housewives and the disabled. Such government efforts to narrow the digital divide achieved some improvements across regions, incomes and gender, but the problem persisted. In September of 2001 the government created a comprehensive plan that 14 agencies, including MIC would promote over the ensuing five years.  

Another strategy pursued by the government was to deeply embed computer literacy into Korea’s ultra-competitive university entrance examinations, making a home personal computer a necessity for any seriously education-minded parent. All Koreans immediately know what is meant by the term “education parents.” Broadband access thus became part of the package needed for computer literacy, driving subscriptions for households with school age children.  

The 2009 study by the Berkman Center at Harvard noted that the most systematic and extensive demand side program among all of the countries it looked at was in South Korea. In other countries of the world, it found only bits and pieces of the Korean program.

Broadband and Progress in Strategic Restructuring

The broadband revolution in South Korea began in the 1990s, amid hints that it was coming in other countries around the world. However, Korea was almost half a decade ahead of most other industrialized nations in providing fast and efficient broadband service to the majority of its population. As the following summary underscores, its broadband revolution was decisively shaped by the strategic approach of the government and industry toward restructuring of the telecommunications sector.

Structural Changes

The arrival of broadband internet in South Korea coincided with sweeping changes in the nation’s political, social and economic structures. Politically, the nation’s first two democratically-elected civilian presidents, Kim Young Sam and

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222 Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 172.
Kim Dae Jung, embraced and promoted broadband internet and the nation’s continued informatization.

Economically, the country experienced unprecedented growth until 1997. In that year the Asian economic crisis, known as the “IMF Crisis” in Korea, forced the incoming administration of Kim Dae Jung to make some difficult choices. One of them was the decision to intensify and broaden efforts at informatization.

The social changes and stresses associated with such rapid economic growth and political change included continued urbanization, a growing “education exodus” as more and more students opted for study abroad, and a recognized problem with “internet addiction” to name a few.

**Institutions**

The power and influence of the Ministry of Information and Communication (MIC), which had begun in the 1980s, continued to increase throughout the 1990s. It was the leading Ministry in helping the government introduce broadband internet. Although rivalries with other key ministries did not disappear, the role of the MIC became increasingly prominent during the 1990s and into the new millennium.

Another major change relating to government institutions in the 1990s was that informatization and the building of Korea’s “information superhighways” was clearly elevated to the level of a national priority. Accordingly the Blue House and the Prime Minister’s Office became directly involved with virtually all key activities.

As we have recounted in this chapter, the role of the private corporations was also significant in the introduction of broadband to Korea, and it became more influential as market certainty increased. In particular, the competition among ISPs, each with a different strategy, helped to accelerate the diffusion of broadband.

ThruneT entered the market early, taking advantage of an existing CATV network. Consequently, Hanaro Telecom could not avoid offering unprecedented ADSL-based broadband service. KT could delay entering this market because of its monopoly status, but when it did enter, this triggered explosive growth, by leveraging its already installed telephone network and inducing the entry of numerous equipment manufacturers.\(^{223}\)

**Politics and Policies in South Korea’s Broadband Revolution**

The politics of telecommunications policymaking were as lively as ever during the 1990s, especially in the midst of and immediately following the IMF crisis. Different government and industry organizations made widely varying estimates concerning the pricing and likely market evolution of broadband internet. There was ample debate. The end result was so successful that quite a large number

of studies have addressed the role of government policies and other factors in South Korea's rapid adoption of broadband internet. Korea drew attention not only from other developing countries. For example, European experts looked at Korea because a wide penetration of broadband services was seen as a key for developing Europe into an information society.224

A Shift Toward the Private Sector

Although the government continued to play a vital leadership role, the policy balance on the dimension of private versus public initiative swung toward the private sector. By not imposing any strict regulation on broadband, government policy encouraged multiple carriers to enter the market and compete with each other. This competition reduced prices, which in turn helped the companies to obtain a critical mass of customers within a short period of time. The major broadband service providers competed not only on price, but also in terms of other marketing activities.

Korea’s policy also showed the value of allowing the private sector to shoulder the burden. During the 1990s, owing to a distinctive set of domestic and international pressures, the policy balance in Korea swung further away from the government and toward the private sector. However, government and industry continued to work hand in hand.

The rapid diffusion of high-speed broadband internet in South Korea showed the viability of what some analysts have termed “managed competition,” or “strategic liberalization.” In this nation, the government’s leadership in managing this competition was exerted primarily through a strong lead bureaucracy, the Ministry of Information and Communications.

Price and Facilities Competition

Broadband internet service was initially classified by the Korean government as a value-added service, and therefore was free of regulation regarding entry and pricing. This encouraged several full service providers to enter the market; setting retail prices at levels low enough to encourage dial-up users to switch to broadband. In addition, facility based competition encouraged the expansion and upgrading of fiber optic access networks, which would be essential to advancing the information society.225

As already noted, prices for broadband internet services in South Korea were among the lowest in the world. Stringent price competition with Korea Telecom has been identified as one of the factors that forced the new service providers, Hanaro Telecom and Thrunet, to adopt a disruptive pricing strategy. The


strategy was disruptive in the sense that they initially set prices so low that they could not recover short-term marginal costs. As a result of their pricing strategies, both Hanaro and Thrunet ran into serious financial difficulties.

Although KT’s new rivals were denied the opportunity to use KT’s network to deliver their services “the last mile,” they scrambled for efficient alternatives. They used fiber capacity leased from the Korea Electric Power Corporation, cable TV lines and new transmission facilities built from scratch. Competing networks emerged and broadband took off.226

Of course, Korea’s high population density is one factor that allowed broadband providers to lower their costs. In any event, competition, especially price and facilities-based competition is clearly one of the success factors in South Korea’s rapid deployment of broadband internet.227

It is noteworthy that South Korea achieved broadband internet success without local loop unbundling. One study notes that Korea is a fascinating example of broadband deployment because “. . . it has moved so far ahead of all other countries in broadband penetration without any wholesale regulation of the incumbent telecommunications carrier, Korea Telecom.”228 The fact that the Korea Electric Power Corporation’s (KEPCO) fiber optic network reached most of the nation’s high rise apartments in which a large portion of the population lived, meant that competitive suppliers could readily gain access to transmission facilities. Thrunet, Hanaro and other carriers were able to compete aggressively with Korea Telecom. For this reason, competition in Korea did not depend upon mandated unbundling or the provision of wholesale broadband services by the incumbent carrier. Korea did introduce local loop unbundling in 2003, but for other reasons than to achieve broadband penetration.229

**Foreign Versus Domestic Influences**

Arguably, foreign influence on South Korea’s telecommunications policy reached a zenith during the IMF crisis in 1997-98. Faced with the possibility of a national default without IMF assistance, the government had every reason to introduce measures to liberalize the economy, and that included the telecommunications sector. The economic adjustment was painful and many employees of large companies lost their job during the crisis.

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However, Korea also turned inward toward its own domestic sources of strength during the IMF crisis. It viewed the economic readjustment as an opportunity to carry out computer literacy and informatization training on a scale that was at that time unprecedented. The country’s leaders proclaimed, in effect, that education for the new information era was the only road forward for Korea if it wanted to get out the economic crisis, and more importantly, resume its progress toward becoming an advanced nation.

**Decentralized Policy: Demand Magnification**

Along with the introduction of facilities-based and price competition and a larger role for the private sector, the growth of broadband internet in Korea saw the policy pendulum swing from centralized toward more decentralized policies.

Government policy contributed to the demand side of information society development in at least three ways. First, in 1996 informatization was elevated to the highest levels of national policy. Second, the e-government program was systematically promoted for all government agencies. This helped to ensure that the 23 percent of GDP (cite OECD World Bank Institute study) accounted for by government expenditures would go toward building an information-based society. Finally, there was a continuation and strengthening of the broad national campaign to build an information society that had started in the 1980s. It involved public and private institutions at all levels throughout the nation.

In terms of the strategic restructuring model, the national fervor for and pride in building an information society provides strong evidence that the policy pendulum was swinging toward decentralization of telecommunications policy. This meant putting the power of new digital technologies in the hands of the people and encouraging their involvement.

**Chapter 5: The Mobile Revolution: Early Innovation and the “iPhone Shock”**

“A mountainous country like Peru needs WiBro technology.” President Lee Myung Bak comment to Peru President Alan Garcia, November 21, 2008

The mobile revolution in Korea started earlier than overall global trend and had a large impact on the nation’s digital development. However, two seemingly contradictory aspects of this revolution reveal much about both the country’s strengths and its relative weaknesses in building its part of the global information society. On the one hand, its hardware and networks quickly became cutting edge technology of a sort, becoming the first nation in the world to introduce

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nationwide CDMA networks, mobile television, and mobile Wimax (WIBRO). On the other, South Korea ironically lagged about two and one half years behind many other countries of the world in the actual adoption and use of mobile broadband as people in other nations were doing with the iPhone, Android phones and other smart-phones. This created what has been variously referred to as the “iPhone shock,” or “smart-phone shock” in South Korea, beginning in December of 2009.

This chapter will tell the story of Korea’s unique experience with the diffusion of mobile communication, and will place it in the context of global developments. As in earlier chapters, we look at key policy debates and how they affected Korea’s approach to strategically restructuring its telecoms sector. The chapter concludes with a look at the integral role mobile communications are playing in Korea’s efforts to build the ubiquitous networked society.

The Diffusion of Mobile Telephony Worldwide and in South Korea

To place the revolution in mobile telephony in perspective, just think for a moment of the mobile handsets that were in use at the time of the 1988 Seoul Olympics. They were manufactured by Motorola and were large, heavy, brick-like hand units that in fact required two hands to operate. Today’s typical mobile phones would fit within the keyboard apparatus of those bulky devices.

Since that time telephone customers around the world have “cut the cord” in a mobile communication revolution. The transformation draws much of its strength from the “law of mobility,” which states that the value of a product increases with mobility. A simple measure of mobility is the percent of time that the product is available for your use.  

Mobile communication seems an especially powerful and natural complement to interpersonal communication in Korea where the culture is homogeneous and each person is expected to be properly oriented toward other members of the family, local community, school classmates and other important social reference groups. All over South Korea today, young and old, students, farmers, fishermen, secretaries and salary men communicate with their mobile phones. Watching television or video is not only common on cell phones, but on car navigation devices and iPod-like portable media devices. At certain times of the day, more

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231 McGuire, Russ, *The Law of Mobility*, Sprint Nextel, December 2005, p. 5. The law is named after Russ McGuire, Director of Business Strategy for Sprint/Nextel, who is credited with first stating it. As he elaborates, “Thanks to a combination of Moore’s Law, scalability resulting from Metcalfe’s Law, device convergence and the increasing ubiquity of 3G wireless networks, the cost of making any product (especially one involving information) available all the time is plummeting. Therefore, just as computing power and the internet have been built into virtually every product, mobility is beginning to be built into every product.”
Koreans today watch television via these mobile devices than on conventional television sets in the home, school or office.

Mobile communication seems not only well suited to the Korean mindscape, but also to its mountainous landscape.\textsuperscript{232} On balance, the infrastructure requirements for mobile telecommunications are well suited to the mountainous terrain of not only the Korean peninsula, but also many developing countries in Latin America and Asia. Although mountains naturally create coverage holes and shadow areas, they also provide good sites for cellular transmission and reception towers because of their higher elevation. Moreover, remote mountainous areas greatly increase the cost of laying copper or fiber optic cable.

Statistically, an important milestone occurred in South Korea and worldwide, when the number of mobile phone subscriptions exceeded those for landline phones. In 1999 the number of mobile telephone subscribers in South Korea overtook the total of fixed line subscribers, as shown in the following figure. This made Korea one of the first fifteen economies in the world to make this important transition.\textsuperscript{233} Worldwide, the number of mobile subscriptions exceeded total landlines worldwide by 2001, marking a momentous year for the telecommunications industry. Underlying those numbers was the remarkable progress mobile telephony had made in reaching people who lived in the developing nations of Africa, Asia and Latin America.

However simply comparing the relative penetration of mobile versus fixed telephony in Korea with the worldwide averages is less than satisfactory because every country, whether developed or developing, had different starting points and diffusion curves for both fixed and mobile communication. Therefore, in Figure 5.1 we present data for Korea, the United States and China, during the ten year period in which each of those nations experienced the crossover point at which mobile subscriptions exceeded those for land lines.

FIGURE 5.1 ABOUT HERE

\textsuperscript{232} Choe, Chungho, “Korea’s Landscape and Mindscape,” Koreana WINTER 1994, Vol. 8, No. 4. \url{http://www.koreana.or.kr}

Mobile telephony was introduced to South Korea in 1984 by Korea Mobile Telecommunications Corporation (KMT), which started out as a subsidiary of Korea Telecom. KMT provided service based on AMPS (Advanced Mobile Phone Service), a first generation analogue mobile standard developed by Bell Labs in the U.S. It relied almost exclusively on Motorola and AT&T for infrastructure and handsets.

 Subscriber numbers developed in a very sluggish fashion and by 1993 the country had a mobile phone penetration rate of only 1.1 subscribers per 100 inhabitants.\textsuperscript{234} For the next eleven years, through 1994, KMT enjoyed a monopoly and adoption of mobile telephony was slow, reaching only two subscribers per 100 inhabitants by 1995. In 1994, KMT was sold to the SK Group and since then has operated as S.K. Telecom

As shown in Figure 5.1 Korea reached the transition point at which it had a larger number of mobile than fixed telephone service subscribers in 1999, three years before China and a full four years before the United States. However all three of these countries had rather dramatically different starting points for the ten years of data represented in the Figure. The United States started with a very high teledensity of 66.6 in 1999, and a rather low mobile subscription rate of 30.24. South Korea, on the other hand, had a lower teledensity and relatively high mobile penetration in 1999, so that it was close to the transition. Finally, China started with lower numbers on both measures in 1999.

Another factor that helps to explain Korea’s relatively rapid adoption of mobile communication is its decision to adopt CDMA as a national standard. The six-year period between 1995 and 2002 represented the strong years of CDMA diffusion in South Korea.\textsuperscript{235}

Finally, although Korea was the first country in the world to commercialize CDMA technology and to achieve near universal use of broadband-capable phones, it is important to underscore that this did not mean near universal use of mobile broadband! The ITU report \textit{Measuring the Information Society 2010} contains statements that could easily be misinterpreted by those not familiar with the Korean market.\textsuperscript{236} For example, Korea was one of the first countries “… worldwide to adopt mobile broadband third generation technologies and by the end of 2008 the country had over 35 million mobile broadband subscriptions for a

\textsuperscript{234} Gruber, Harold \textit{The Economics of Mobile Telecommunications}, Cambridge University Press, 2005, p. 140.

\textsuperscript{235} \textit{Ubiquitous Network Societies: The Case of the Republic of Korea}. ITU, April 2005, p. 18.

\textsuperscript{236} The ITU report does contain a cautionary note that the measure of mobile broadband subscriptions does not equate to use. However, there is no specific reference to the Korean case.
population of about 49 million people.” Mobile broadband subscriptions per 100 inhabitants is one of the three sub-indexes of ICT use in the ICT Development Index, so Korea benefits on this measure. However, it is important to stress that subscriptions, especially in the Korean case, did not equate to use. In fact, usage rates were very low compared to many other countries.

**Early Innovation in Korean Mobile Communication**

South Korea began the mobile era with a series of important innovations. The first of these was a somewhat risky and bold decision to adopt code division multiple access (CDMA) technology as its standard for mobile communication. This decision made Korea the first country in the world to commercialize CDMA and to use it nationwide.

**A Bold Decision to Adopt CDMA**

The mobile communications revolution in South Korea built upon the nation’s experience in the 1980s in several ways. The strategic, long term decision to develop CDMA technology took into account the future likelihood of success not only in the Korean market, but for CDMA exports. Notably, the same key people who had guided the TDX and 4MB DRAM projects in the 1980s were still in top-level decision-making positions. In short, the CDMA project was a classic example of government-led innovation.

As with the TDX Project there were four main actors in the innovation system for the mobile telecommunications industry. They were the Ministry of Communication, the government research institute ETRI, the local equipment manufacturers and the mobile telecommunications service providers.

By the late 1980s, both international and corporate pressures on Korea’s mobile telecommunications sector were building. One set of pressures came from continued change in digital computing and communications technologies. The other arose from bilateral trade talks with the United States and multilateral talks involving other countries urging Korea to liberalize its telecommunications market. Korean government officials had taken note that monopoly keeps prices high, and encourages poor management, deterioration of service, and inefficiency. Within the MOC, there was a growing sense that the ministry itself could benefit from growth in the mobile sector.

The story of how the Korean government came to the decision that CDMA would be its standard for mobile telecommunications is a tour de force of the politics of telecommunications policymaking in South Korea.

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The Politics of Liberalization in Korea’s Mobile Telecom Sector

The liberalization of Korea’s cellular market came in the early 1990s and involved political struggles between industrial and bureaucratic interests and a turf war between two powerful ministries. There was also a scandal involved, but the end result of all this was a strengthened commitment to deploy CDMA. That technology choice ultimately had an enormous impact, not only on mobile communications in South Korea, but also on its exports and role in the global marketplace.

A bureaucratic turf war over control over the emerging cellular sector occurred between Korea’s Ministry of Communications (MOC) and Ministry of Trade, Industry and Energy (MOTIE). The struggle revolved around three main issues: the level of chaebol involvement in telecommunications services, the timing of entry for new competitors, and the choice of the CDMA standard.

The introduction of cellular competitors to KMT pitted the MOC, which wanted to limit chaebol influence in the sector, against MOTIE, which was interested in boosting the manufacturing base of the conglomerates. The chaebol had been interesting in directly operating telecommunications services for some time, but the MOC, fearing chaebol dominance of the services market, had continually rejected their attempts to enter. The MOTIE, which oversaw high tech manufacturing and exports, disagreed, contending that chaebol participation in telecommunications services was critical to their technological competency. The political battle between the two ministries reached a head in 1991, and reached the level of the Prime Minister’s office and the powerful Economic Planning Board. The MOC tried, unsuccessfully to engage the incumbent Democratic Liberal Party to weigh in on its side, but was forced to agree to the licensing of a chaebol as the cellular competitor to KMT.

MOC and MOTIE also clashed over the timing of entry for the new mobile competitor. The MOC wanted to introduce a second carrier soon, by 1994, to encourage competition. However, MOTIE wanted to delay for one or two more years, allowing time for domestic manufacturers to develop competitiveness in infrastructure and equipment, decreasing reliance on imports. Foreign companies joined the MOC’s side in this debate and Motorola tried to alleviate MOTIE’s concerns by promising it would transfer technology to Korean firms. However, the EPB weighed in on MOTIE’s side. One issue that all the participants in the debate agreed upon was the strict limitation of foreign participation in the cellular market. The MOC stipulated that foreign interests could join consortia led by domestic firms, without management rights.

The final issue in the debate between the MOC and the MOTIE was that of a standard for mobile telecommunications. In the early 1990s the mobile

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telecommunications was evolving from an analog to a digital system. Korean firms were faced with two options. They could either adapt to the new digital technology by importing the products of TDMA-based companies, or they could try to commercialize CDMA on their own.²⁴⁰

The close government-industry cooperation in the CDMA development project at ETRI was one factor that sparked a major conflict between MOC and MOTIE over the choice of CDMA as a mobile standard. By the early 1990s MOTIE’s status was declining as the chaebol gained international competitiveness and required less government support. Yet MOTIE had an institutional prerogative to retain its institutional jurisdiction over manufacturers. In 1993 it published a report critical of the MOC’s plans for CDMA, arguing that TDMA, the basis behind the globally popular GSM standard, had more potential to become internationally dominant. By contrast, CDMA showed potential, but was as yet unproven. MOTIE even went so far as to launch TDMA research programs and encourage manufacturers to join.

Of course, the MOC immediately opposed MOTIE’s efforts, pointing out that CDMA was technologically superior and more flexible in its future applications. The bureaucratic turf war between the MOC and MOTIE led the MOC to strengthen its plans for CDMA. It moved the date for deployment of commercial CDMA ahead by two years. More significantly, it used all of the jurisdictional authority at its disposal to promulgate CDMA as the sole domestic digital standard.

An interim outcome of the political debates was the awarding of a license in 1992 to the Daehan Telecom (Greater Korean Telecom) consortium, backed by the Sunkyong chaebol group. It was a second license for analogue mobile telephony, rather than CDMA. However, allegations of favoritism arose over President Roh, Tae Woo’s close relationship with the Sunkyong Group, given the government’s high level of discretion in granting the license. A political firestorm ensued, forcing Daehan Telecom to return its license. The MOC was then forced to wait for a change in political leadership to conduct a second round of licensing.

In 1993, before the next round of licensing, the government announced that the standard to be adopted would be CDMA rather than the analog license that had been granted to Daehan Telecom. Thus, a long and heated debate ended with the decision to adopt the U.S.-invented CDMA as Korea’s wireless standard, even though most of the world was dominated by the GSM standard. The second license was granted to Shinsegi, a consortium led by the steel company POSCO. Shinsegi had wanted to build a GSM network, since CDMA was not yet commercialized, but the MOC rejected that option.

The MOC’s use of this trump card was bolstered by a 1993 decision of the US. Telecommunication Industry Association that it would recognize CDMA. In the end, the MOC strategy had a decisive effect on the manufacturers who found it made more sense to them than following the MOTIE. If they developed TDMA, their exports would be limited to markets in which they were newcomers, and they would be closed out of the domestic market. On the other hand, CDMA offered them access to a rapidly growing domestic market and a chance to develop high levels of competence for entering global markets.  

After the MOC – MOTIE debate was settled, there was a second round of research to commercialize CDMA. It was conducted largely by industry in partnership with Qualcomm, under a task force of Korea Mobile Telecom (the mobile division of KT which had been spun off in 1988). The government subsidized approximately $6.7 million from the Information Promotion Fund. In 1994 KMT contracted LG to provide base stations and handsets, while Sinsegi selected Samsung in 1995. These moves cemented the close carrier-manufacturer R&D relationships in the Korean mobile industry.

Development of the market in South Korea was promoted through massive entry. Two licenses for digital mobile telecommunications via CDMA technology were assigned in 1995, one to SK Telecom and the other to Shinsegi Telecom. At the same time, three PCS licenses based on CDMA technology in the 1800 Mhz range were awarded to Korea Telecom Freetel (KTF), LG Telecom and Hansol. The entry of four new firms and the establishment of a nationwide standard led to very rapid expansion in the number of subscribers until 2000. Then there was a slowdown and wave of consolidation in the industry. SK Telecom merged with Shinsegi and KTF merged with Hansol.  

The Commercial Development of CDMA Technology

The government decided to give the Electronics and Telecommunications Research Institute (ETRI) a lead role in developing CDMA technology. At that time, ETRI had 1800 scientists and engineers, but most importantly, it had proven its capabilities through the successful TDX and 4MB Dram projects in the 1980s.

For ETRI, CDMA represented a major strategic direction for the lab and for its innovation capability. In fact, most of the world had already opted for GSM. However, at the time TDMA systems such as GSM and Digital AMPS were

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perceived to be maturing technologies that were approaching their performance limits. CDMA, on the other hand was a future technology with greater possibilities. At that time, the United States telecommunications industry was wary about CDMA as an expensive, complex and unproven technology. Until the Korean government decision, CDMA existed only as a theoretical concept in which Qualcomm, a small American company, had patents.

With the knowledge that they needed to move ahead into digital technology for mobile communications, Korea’s Samsung and LG Electronics approached several telecom companies around the world to explore the possibility of acquiring technology. However, companies such as Motorola were only interested in exporting their products into Korea. Moreover, European firms such as Ericsson and Nokia had already developed their “global system for mobile communications” (GSM) digital technology and were not willing to share it with Korean manufacturers. This made Korea’s choice to pursue CDMA easy, in a sense, because it was the only choice if the nation was to develop its own technology capacity.

The MOC had outlined plans to develop a new mobile standard in 1988. The development history of CDMA in Korea was spread out over a period of nine years, beginning in 1989. The main difference between this project and the TDX project was that this was a proprietary technology originally developed and owned by the U.S. company Qualcomm. Therefore, it was conceived as a joint development project. As in the TDX project, ETRI was the main Korean institution, this time working with Qualcomm as an international partner in the technology transfer program.

In 1991, four domestic manufacturers, Hyundai Electronics Industries, LG Information and Communications, Samsung Electronics and Maxon Electronics joined the project to develop a commercial CDMA system with a target date for commercial service of 1996. The key components in CDMA were three application specific integrated circuit (ASIC) chips (MSM or Mobile Station Modem chipsets). These were initially supplied by Qualcomm, but over time ETRI and the Korean manufacturers developed their own versions. Over the

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246 Dr. Hwang, Jong Sung National Information Society Agency NIA Vice President Interview, July 10, 2009.

course of the CDMA project, ETRI was able to keep pace with changes in
technology and move to its next frontier.\textsuperscript{248}

The total cost of the CDMA project over its entire time span has been estimated
at U.S. $65 billion. Samsung alone spent more than $200 million on the project,
which involved 1,200 researchers. Part of the financing came from service
operators, who were required to donate a percentage of their revenues to
research and development. Another part came directly and indirectly from
consumers who had to pay a special tax on signing up, up to $1,000 for a
handset, along with deposits and activation fees.\textsuperscript{249}

The CDMA project had a huge market creation effect for South Korea. First, its
companies were able to acquire both innovation and manufacturing capability not
only in CDMA but in GSM as well. Second, this new capability led to increasing
exports of both handsets and base stations. The following table shows how large
the market-creation effect of CDMA was estimated to be compared with other
major technologies developed by ETRI.\textsuperscript{250}

TABLE 5.1 ABOUT HERE
Table 5.1: Estimated New market effect of major technologies developed by ETRI, 1976-2003 (in billions of Korean Won)

<table>
<thead>
<tr>
<th>Type of Technology</th>
<th>Period</th>
<th>Domestic Supply</th>
<th>Export Sales</th>
<th>Total Sales</th>
<th>R&amp;D Investment</th>
<th>New Market Creation Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDX</td>
<td>1978-1993</td>
<td>4470</td>
<td>522</td>
<td>4992</td>
<td>107</td>
<td>46.65</td>
</tr>
<tr>
<td>CDMA</td>
<td>1989-1996</td>
<td>34970</td>
<td>19070</td>
<td>54040</td>
<td>78</td>
<td>692.82</td>
</tr>
<tr>
<td>Optical Transmission System</td>
<td>1993-2001</td>
<td>1910</td>
<td>12</td>
<td>1922</td>
<td>50</td>
<td>38.44</td>
</tr>
</tbody>
</table>

Computed from data provided by Electronics and Telecommunications Research Institute (2003)

As part of the agreement, the manufacturers had to pay Qualcomm a royalty of 5.25 percent of the total handset price, excluding the cost of packing and batteries, instead of paying a royalty on only the chip and software. Over time, with the introduction of newer phone models with cameras and other features, these royalty payments became burdensome for Samsung and LG. From 1999 through 2002 they were at an estimated level of well over US $200 million annually.\textsuperscript{251}

From 1995 to 2002 it was reported that Korean mobile handset manufacturers paid Qualcomm U.S.$ 1.26 billion in royalties. Eighty percent of this amount was accounted for by royalties paid by Samsung and LG Electronics.\textsuperscript{252} By 2007 it was estimated that Korean handset makers were paying Qualcomm more than $500 million annually in royalties.\textsuperscript{253} After an investigation, the Korea Fair Trade Commission (KFTC) in July of 2009 fined Qualcomm $208 million dollars for abusing its dominant position in the market. To that date, this was the largest fine ever levied by the KFTC, Korea’s anti-trust watchdog. The KFTC accused Qualcomm of collecting royalties in a discriminative way and of offering conditional rebates to Samsung and LG Electronics in return for purchasing its CDMA modem chips.\textsuperscript{254}

In November of 2009 a development took place that appeared to signal a turning point in this dispute over royalties. Samsung Electronics and Qualcomm signed a fifteen year contract for the cross-licensing of wireless telecommunications technology. Under the contract, Qualcomm gained the right to use Samsung’s 57 patent licenses in mobile technology and Samsung negotiated a reduction in the 5-5.75 percent royalty per handset it had been paying to Qualcomm. Although the details of the agreement were not made public, it was clear that Qualcomm stood ready to negotiate a similar arrangement with LG Electronics and Pantech.\textsuperscript{255}

The “Mobile Triangle” and the Handset Subsidy Debate

With five carriers in the market, after 1995 Korea’s cellular subscription fees and per minute charges dropped rapidly. The logic of competition moved toward subsidies for handsets, just as it had in Japan. Subsidies for a typical handset costing $440 USD began at about $160 in 1997 but by 1999 had escalated to the point where handsets were being given away. Unlike Japan, the subsidies were in exchange for ever-longer obligatory subscription periods, reaching three years by 1999. In the late 1990s a policy debate that caught the MIC off guard shifted the dynamics of competition away from subsidized handsets.256

One factor that greatly stimulated the rapid diffusion of CDMA technology in Korea was government policy on handset subsidies. When the first CDMA networks were introduced in 1995, the handsets were very expensive and few citizens could have afforded them. Thus, to help create a market for the new technology, the government instituted a policy by which mobile providers could lock subscribers into a two-year, exclusive contract in exchange for free handsets. The government also kept the maximum per-minute charge high so that the mobile carriers could earn sufficient revenues. Furthermore, by giving out free handsets, the mobile operators could buy phones in bulk, thereby reducing per-unit costs. In general, the close coordination among government, industry and service providers in Korea has been called the “Mobile Triangle.”257

The issue of handset subsidies eventually became a high-profile political football that pitted the MIC against the Korea Communications Commission (KCC) and the Korea Fair Trade Commission. The MIC regulated subsidies under the Telecommunications Business Act. When they reached the point where carriers were giving away phones in exchange for increasingly long lock-in contracts, the MIC moved to cap subsidies at approximately $125. However, the core problem was the practice of carriers who were not required to fully explain or give documentation to customers about the termination penalty. Consequently, the KFTC in response to consumer complaints ordered the abolition of penalty clauses that required consumers to return the subsidy amount when terminating their contracts early.

The cellular markets reacted to this move abruptly and dramatically, and consumers began rapidly switching handsets. This raised Korean imports for handset components at a bad time for the government in 1999, just when the top political priority was to meet the IMF bailout conditions for balance of payments. The MIC, in favor of ensuring carrier profitability and competition with SK Telecom, moved forward to curb subsidies. However, an informal industry

arrangement to cap handset subsidies was viewed by the KFTC as industrial collusion, and it stepped in to levy fines on the carriers. This interference in what the MIC viewed as its jurisdiction was too much. In June 2000, the MIC banned handset subsidies altogether.\footnote{Kushida, Kenji Erik. “Wireless Bound and Unbound: The Politics Shaping Cellular Markets in Japan and South Korea,” BRIE Working Paper 179a, February 1, 2008, p. 32,33.}

Following the ban, consumer demand for handsets dropped dramatically. In response, the MIC attempted to alleviate the suffering of handset manufacturers by allowing installment sales of handsets. The Ministry further tried to strengthen SK Telecom’s competitors by exempting subscribers switching from SKT to other carriers from certain fees. However, the KCC objected to this latter move, arguing that asymmetrical regulation hindered fair competition. Korean consumers also became active in this issue, with protests against the carriers. They called for the abolition of handset subsidies, in exchange for 40% lower subscription fees. Korean consumer groups even organized a rotating sit-in in front of the MIC for the better part of a year.\footnote{Kushida, Kenji Erik. “Wireless Bound and Unbound: The Politics Shaping Cellular Markets in Japan and South Korea,” BRIE Working Paper 179a, February 1, 2008, p. 33.}

The Debate over Standards for 3G Mobile Communication

The debate in Korea over mobile standards did not end with the adoption of CDMA. Internationally, a political struggle took place over which 3G standard to use. It pitted a European-Japanese alliance favoring GSM against the United States government which lobbied on behalf of Qualcomm’s CDMA technology. The result was a compromise in which two incompatible standards were approved.

The first standard, W-CDMA was positioned as an upgrade from GSM, the dominant standard in Europe and the one with the most subscribers worldwide. The other, CDMA2000 was developed by Qualcomm and involved incremental upgrades from the technology used in North America and South Korea.

In the debate over standards for second generation (2G) mobile communication, the Korean government had adopted a single \textit{de jure} standard. However, when it came to third generation (3G) the choice was more difficult. CDMA2000, the Korean CDMA standard, only controlled about twenty percent of the global market. W-CDMA was expected to take the rest of the market for mobile services, in which global roaming would be a critical component.

The rise of a global standard affected the entire industry and changed the interests of telecoms firms. In this situation, the MIC wanted to ensure that at least one Korean service provider used the home grown CDMA2000. In 1999 it announced that it would award 3g licenses. Concerned that excessive competition might deprive operators of the capital needed to build out networks, it
limited the number of licenses to three. This policy prompted a wave of consolidations in which SKT acquired Shinsegi Telecom in 1999, and KTF acquired Hansol in 2001. Consequently three consortia, SKT, KTF and LG Telecom applied for the 3G licenses.

The MIC announcement was followed by another political battle, this one involving the Ministry, carriers and equipment providers over who should apply for which license. The MIC argued that one or two carriers should adopt the W-CDMA standard since it was projected to be the most widely-deployed around the world as the successor to GSM. The existing carriers also argued for W-CDMA, even though it would mean building an entirely new infrastructure. In contrast the equipment manufacturers, including Samsung, Hyundai and small CDMA equipment providers strongly preferred CDMA 2000, although they did not take a strong public position.

The government, in balancing these considerations, urged adoption of CDMA 2000 in order to facilitate exports. The MIC eventually recommended that two of the three carriers apply for CDMA 2000 licenses and one for W-CDMA. However, the carriers disregarded this advice and all three applied for W-CDMA licenses. The government then granted two of these, to the SKT and KT consortia. In the end, the government used a combination of informal pressure and financial incentives (lower licensing fee) to convince LG to apply for a CDMA 2000 license.

The strained circumstances in the licensing of 3G CDMA, along with the slow growth of W-CDMA in Europe, created a situation where Korea’s carriers did not rush to implement W-CDMA networks. Instead, SKT and KTF chose to continue incremental upgrades of their existing CDMA networks, even though they could never reach full-fledged CDMA status since they were licensed for W-CDMA. A major reason was the CDMA 2000 1x EV-DO had faster data transmission speeds than the initial W-CDMA standard. Once W-CDMA could offer comparable speed, SKT began to introduce W-CDMA and the service grew in popularity, starting in 2006-7.

Benefits of the CDMA Decision

Although the decision to go with CDMA carried risks, it brought tangible benefits. First, the shift to CDMA in Korea achieved the government’s main strategic objective of nurturing domestic manufacturers and reducing the country’s dependence on foreign equipment. Korea thereby achieved a degree of technological independence. Since Korea was the first country to commercialize CDMA, Motorola and the other international firms that dominated Korea’s equipment market had no expertise with the new technology. Consequently, Motorola’s equipment share plummeted, even as Korea’s cellular market expanded rapidly. In 1995, Motorola had slightly more than half of this market, but by 1999 domestic equipment manufacturers controlled 90 percent of the market.
Second, as proponents had argued, CDMA was technically superior for dealing with the expected increased public demand for mobile communications services. The rapid diffusion of mobile telephony in South Korea is a matter of record.

Third, Korea’s collaboration with Qualcomm to commercialize CDMA yielded significant benefits in international markets. Korean manufacturers paid significant royalties to Qualcomm, which held the core intellectual property rights. In return, they were given the right to distribute CDMA handsets worldwide, an arrangement that paid off handsomely when major American carriers adopted the standard for their digital networks.

CDMA equipment, including mobile handsets, rapidly became South Korea’s second most important strategic export market, after memory chips. As of the end of 2005, approximately 285 million people in 77 countries around the world were communicating with CDMA technology developed in South Korea. According to the Ministry of Information and Communication, CDMA-related research and production had by that time an inducement effect of $400 billion dollars and had employed approximately 3.1 million persons from 1996-2005.

The World’s First Digital Multimedia Broadcasting (DMB)

In 2005 South Korea introduced a second innovation into mobile communication in the form of Digital multimedia broadcasting (DMB). Korea thus became the first nation in the world to introduce mobile TV. DMB used digital radio to send radio, TV or data to mobile phones, navigation systems and other mobile devices via either satellite or terrestrial channels. Delivery of the signals via digital broadcasts was a far more efficient approach than sending individual data streams to each viewer’s handset, as was mostly done in other countries.

The technology proved very popular with consumers in South Korea. South Koreans are presently the world leaders in the viewing of mobile television. Twenty-seven million people or about 56 percent of the population view regularly. Twenty-five million of those watch free terrestrial broadcasts, which carry

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advertising, while another two million pay to subscribe to satellite programming.\textsuperscript{264}

While the consumer appeal of mobile television is unquestionable, a major problem has been finding reliable revenue streams to keep the services afloat, with neither the advertising or subscription-based business models fully succeeding.\textsuperscript{265} Initial government estimates had indicated that advertising revenue would be sufficient to support Digital Multimedia Broadcasting but as of early 2009 it appeared that this might not be the case. A combination of increasing debt and sluggish advertising revenues caused them to consider halting their coverage on subway lines to keep the business afloat. In 2006 the countries six terrestrial mobile television companies had jointly invested in order to allow commuters to watch World Cup football games on their handsets.

Despite such difficulties, the Korean government continued its efforts to export DMB technology around the world. Also, Korean companies forged ahead with their developments. In July of 2009 SK Telecom was working with GCT Semiconductor to develop a chip that could simultaneously receive both satellite and terrestrial DMB signals.\textsuperscript{266} All three of Korea’s mobile carriers were also moving quickly to introduce two-way data broadcasting to terrestrial DMB service. This would allow users to be able to do search, shopping and communications while watching DMB programs.\textsuperscript{267}

Korea’s terrestrial DMB companies also have begun to specialize their content in order to attract both viewers and advertising through better targeting. For example, U1 Media, which was already attracting younger viewers interested in professional baseball and basketball, sought to add Starcraft telecasts and become a channel specializing in online and offline games. Another major channel was planning to increase its focus on economy-related programming.\textsuperscript{268}

Also, notwithstanding the challenges DMB faced in the Korean market, export prospects continued to improve. As of mid-2010 countries around the world were


\textsuperscript{265} Kim, Tong-hyung, “Mobile TV May be Off Air on Subways,” The Korea Times, February 15, 2009. \url{http://www.koreatimes.co.kr/www/news/nation/2009/02/133_39561.html}

\textsuperscript{266} Yun, Gun-II, “SK Telecom in Joint Development with GCT for combined DMB Chip,” Jeonja Shinmun, etnews.co.kr, July 2, 2009.

\textsuperscript{267} Hwang, Ji-hye, “Three Big Mobile Carriers Will Open DMB Two-Way Data Broadcasting,” Jeonja Shinmun, etnews.co.kr, June 30, 2009

\textsuperscript{268} Han, Jung-Hun, “Terrestrial DMB will find way to survival with specialization,” Jeonja Shinmun, etnews.co.kr, June 9, 2009.
adopting different DMB technologies and Korean DMB appliance vendors were reportedly thriving in the global television market.\textsuperscript{269}

In late 2009, Korea’s terrestrial DMB broadcasters announced that DMB 2.0, which combines broadcasting and two-way telecommunications would be launched in 2010. The hope was that DMB 2.0 would provide a new business model for wireless internet using data broadcasting and two-way services.\textsuperscript{270} In early 2010, this was followed by an announcement that the new DMB 2.0 service would appear in Android phones.\textsuperscript{271}

DMB equipped cell phones are a popular item in the electronics markets here and, as with SMS messaging, watching television on a cell phone gets a boost from the nation’s excellent system of public transport. Watching television seems to be a sure way to take the boredom out of a long commute by bus, subway or train.

Regardless of its future in the overall media mix, DMB in South Korea has proven that, if it is provided, people will watch free television in large numbers on mobile handsets and other devices. It seems that television is television, whether viewed on a mobile phone, a notebook computer, or a large “home theater” flat screen.

\textbf{Wireless Broadband WiBRO (Mobile Wimax)}

WiBro (for wireless broadband) is a fourth generation communications technology, generally referred to as Mobile WiMAX outside of Korea. The development and commercialization of WiBro resembled Korea’s earlier technology successes. Like earlier efforts, the project was government led, as the Ministry of Information and Communication again designated ETRI to work with a group of companies from the telecommunications sector to develop and commercialize this technology. Also, it represented an effort by Korea to assert its own technology independence in an increasingly global environment, in which Long Term Evolution (LTE), the European-backed alternative for fourth generation mobile communications, would be a strong competitor.

In terms of mobile communications standards, WiBro is a subset of 802.16e, usually referred to as WiMax (Worldwide Interoperability for Microwave Access). The two offer different versions of the same basic wireless standard, 802.16, except for the crucially important difference that WiBro is mobile. Users can connect at broadband internet speeds while traveling at more than 70 kilometers

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\textsuperscript{269} Mun, Bo-Kyeong,"DMB Appliance Vendors Thrive Well in Global Mobile TV Market," \textit{Jeonja Shinmun}, etnews.co.kr, June 4, 2010.

\textsuperscript{270} Mun, Bo-Kyeong,"Terrestrial DMB Will be Changed Dramatically Next Year," \textit{Jeonja Shinmun}, etnews.co.kr, October 27, 2009.

\textsuperscript{271} Mun, Bo-Kyeong,"Two-way DMB Service in Android Phone," \textit{Jeonja Shinmun}, etnews.co.kr, February 11, 2010.
\end{flushright}
per hour. That explains why most of the world will know the technology as Mobile WiMax, and also why we treat it in this chapter.

A critical event in the development of an international mobile WiMAX standard occurred in 2004 when Intel, Samsung and LG agreed to modify the mobile 802.16e standard to harmonize with WiBRO and adopt its physical layer rather than that of the fixed WiMAX standard. This concession by Intel and its allies was seen as a major step toward establishing WiMAX as a globally unified standard.

In October of 2007, the International Telecommunications Union approved the mobile WiMAX platform as the sixth IMT 2000 3G telecommunications standard at its general meeting in Geneva. A representative of the Ministry of Information and Communication (MIC) reacted by stating that “This is a good news for the government and the whole nation. This is the first time for a Korean-developed technology to be recognized as a global standard, and it will help Korea keep its international image as an IT powerhouse.”

In November of 2007 the ITU approved the WiBRO frequency as a common spectrum band for 4G communications, thereby making global roaming possible. For a long time, the WiBRO frequency band had been reserved for military use in the U.S., Europe and Russia. However, this action by the ITU marked a turning point and the technology was expected to go mainstream from that point on.

**The Development of WiBro Technology**

WiBro was selected as one of eight next-generation services by the Ministry of Information and Communication in its so-called IT-839 project. In 2003 a WiBro consortium was formed including Samsung Electronics, SK Telecom, KT and the Electronics and Telecommunications Research Institute (ETRI).

Although ETRI played a key role in the development of WiBro, this technology development project was different than earlier Korean successes in several crucial ways. First, as already noted, it was the first time for a Korean technology to be recognized as a global standard. Second, the development process was led by the private sector, with Samsung Electronics taking the leading role. Third, this technology development was truly global in scope. The process of negotiating to harmonize WiBRO with mobile WiMAX and getting it accepted as an international standard were only part of the challenge. It would also require successful commercialization and sale of the technology in markets around the world, in the face of a looming long-term challenge from LTE.

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In mid-2009 Samsung Electronics announced that it would cooperate with Nokia-Siemens on WiBro Technology. This amounted to a tacit acknowledgement by Nokia that Samsung leads the world in WiBro technology.275

Prospects for WiBro Business in Korea and Globally

Over the long run, Korea’s WiBro technology will compete internationally with LTE, which has substantial backing in Europe. LTE, or Long Term Evolution is a GSM-based technology. In the United States, it received a boost when Verizon adopted it. However, LTE is not to be introduced there until 2010, with mass coverage expected by 2012. WiBro, by contrast, has already been commercialized and tested in Korea, the United States and other countries.

Samsung Electronics has been particularly active early on in exporting WiBro technology, signing deals with Brazil, Kuwait and Taiwan. Samsung is already working on commercial or pilot WiBro projects in 19 countries, including Japan, Russia, the United States, Saudi Arabia, Lithuania and Venezuela. As of July 2009, Samsung Electronics alone had supplied WiBro equipment to 20 out of 23 WiBro service carriers in 22 countries. The majority of these were in the developing nations of Southeast Asia, the Middle East and Africa. The notable exception, of course, was Clearwire in the United States.276

In September of 2009, Samsung Electronics announced that it had succeeded in exporting WiBro under its own name through NSN, the world’s third largest telecommunications equipment firm. Samsung announced that it would supply WiBro equipment worth U.S. $30 million to telecommunications providers including Vmax Telecom in Taiwan. That was on the scale of providing WiBro service throughout Taiwan.277

The WiBro market is forecast to grow from US$3.5 billion in 2008 to US$59.6 billion in 2012, and the number of subscribers increasing from 12 million to 280 million, according to ABI Research, a U.S. technology market research firm.278 As of this writing it is difficult to forecast exactly what share of the global market for fourth generation mobile communications WiBro may capture. Some industry analysts suggest that it may take up one-quarter to one-third of the global market. However, what seems certain is that WiBro is headed for success as a technology developed in Korea and exported to the world.

277 Hong, Ki-Bum, “Samsung Electronics will export WiBro equipments through Nokia Siemens,” Jeonja Shinmun, etnews.co.kr, September 8, 2009.
In October of 2008, XOHM (Sprint’s 4G business unit) launched a citywide mobile Wimax network in Baltimore. An Intel executive noted that “access to the internet with its rich multimedia and social media applications has become an essential and entertaining part of our everyday lives and this network will ultimately redefine where, when and how people enjoy that mobile experience.”

As of this writing, Clearwire had installed mobile WiMAX in 56 American cities across 16 states, including Seattle and Tacoma Washington, Charlotte North Carolina, Daytona Beach, Florida, Richmond, Virginia and Syracuse, New York, to name a few.

The importance of a successful launch of WiBro service in the South Korean market can hardly be over-emphasized, for several reasons. First, it is hoped that a successful launch would accelerate convergence spur innovation and open up new markets. The IT sector has been the engine of South Korea’s economic growth. As an MIC official put it, "we must try to create leading edge environments to turbocharge this engine." The second reason underlying the importance of WiBro is that its success is critical to sustaining South Korea’s status as a test bed for the world in next generation ICT products. Both local companies and international companies value the opportunity to test out new networks and digital devices before exporting them. The third reason WiBro’s success is so important is that it holds part of the key to the success Korea’s companies will have in exporting WiBro network equipment and devices. For companies like Samsung Electronics, a majority of earnings from WiBro will come from export. However, failure of the technology to succeed in South Korea itself would exert a depressing effect on exports. On the other hand, success in Korea tends to have a demonstration effect that would boost efforts to export the technology.

For Samsung and for Korea more generally, success in export markets goes beyond simply the sales of WiBro per se. It could represent a significant foothold in key areas for the next generation of broadband services and could be a major step toward dominating an important wireless standard.

**IP and Patent Activity Generated by WiBro**

As of 2006, South Korean companies and research institutions owned a major share of WiBro-related patents, including 51 percent of the patents relating to a core technology called Orthogonal Frequency Division Modulation. About 20

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percent of various WiBro standard technologies were developed by Samsung Electronics and Samsung developed its WiBro system more than a year ahead of those of other companies, such as Intel and Motorola.\textsuperscript{283}

An industry report in 2008 showed that patents in the WIMAX area had grown to 628 patents, a 27 percent increase over a year earlier. Furthermore, the report noted the continuing dominance of Samsung and Intel in the patent filings, a strong growth in IEEE 802.16e related intellectual property development, and the evolution of WiBro patent filings to application and end-product related work.\textsuperscript{284}

\textbf{WiBro leading to Ubiquitous Networks}

Some observers might question why Korea introduced a mobile internet solution just at the time that fixed WiMax was being introduced in other parts of the world. The answer is that South Korea was already a world leader in broadband internet and mobile telephony. The next phase of media and technology convergence would require both mobility and high speed. Korea required a fast mobile solution as part of its move toward the ubiquitous networked society. Other countries with high broadband internet penetration, such as Japan, Hong Kong and Taiwan, would also be likely to prefer a mobile solution to another fixed technology for connecting to the web.

\textbf{Mobile Broadband and Korea’s “iPhone Shock”}

Despite the extremely rapid diffusion of CDMA-based digital mobile telephony in South Korea the nation was ironically one of the slower ones in the world to actually start using mobile broadband services. In fact the mobile broadband era in South Korea only took off after Apple’s iPhone arrived there fully two and one half years after its launch in the United States, and after it was already in use in more than 80 other countries around the world. In this section we look at some factors in the diffusion of mobile broadband and at why its adoption was delayed in South Korea.

\textit{The Global Shift from Handsets to Services}

The introduction of Apple’s iPhone in the U.S. in mid-2007 and its overwhelming success signaled the start of a revolution in mobile communications. Google’s development of Android and the creation of the Open Handset Alliance were another symptom of this change. As noted earlier, telephones became more than just simply “smart phones.” They were transformed into handheld


computers, with internet access. That meant they could easily handle voice telephony and do so more cheaply than older technology using VOIP services like Skype.

In 2008 a review of industry trends by The Economist called attention to several major developments. First, sales of smart-phones were booming, relative to other mobile phones and industry forecasts suggested that by 2013 they would make up 34 percent of all mobile phones, and half of the total value of the handset market worldwide. Second, as the handsets got smarter, the nature of the industry would change. It would be less about hardware and more about software, services and content, including “apps” for the iPhone, Android-based phones and their competitors. Consequently, a fierce battle had broken out among operating systems for handsets.

The existing operating systems for mobile phones, provided by Research in Motion with its Blackberry, Symbian, controlled by Nokia, and Microsoft’s Windows Mobile, were all proprietary. Therefore they limited what could be done on a phone, especially as users desired more internet-related applications. The introduction of Apple’s i-Phone and Google’s Android-based phone each in slightly different ways disrupted the status quo in the mobile telecommunications market. A general industry consensus developed that most smart phones would ultimately be powered by open source software.

Korea’s Response to the iPhone and Android

Although Korea’s leading handset manufacturers, led by Samsung and LG, responded to the introduction of the iPhone by turning out a growing array of touch-screen handsets, the iPhone was nowhere to be seen in the Korean marketplace. Nor for that matter was the Blackberry, a phone that was popular among business users in overseas markets. In addition to the conspicuous absence of smart phones, Korea’s mobile market had the following characteristics.

First, as late as October 2009, usage of 3G mobile phones in Korea was universal, but only a little more than 10 percent of all customers purchased a data plan to use web-based services because of exorbitantly high data rates. Consumer complaints about exorbitantly high data rates were heard as late as September 2009 when SK Telecom introduced its own App Store, in a response to Apple. Users not subscribed to one of SK Telecom’s fixed rate data plans would have to download apps over its 3G network at a charge of 3.5 won per kilobyte. So, downloading one of the most popular apps, the 1,349 kilobyte

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“2009 Pro Baseball” mobile game would cost users nearly 5,000 won for network usage, in addition to 3,000 won for the game itself.\textsuperscript{287}

Second, the two largest mobile telecommunications service providers in South Korea, KT and SK Telecom, limited their customers to only Korean language content from the internet as part of their custom services. For SK Telecom this was Nate and for KT it was Show. This content was selected, reformatted for mobile and sold to customers. In effect it was an intranet or “walled garden.” Only LG Telecom sold handsets that allowed its users to actually surf the global internet.

Third, until the Spring of 2009, Korea maintained a software requirement called the wireless internet platform for interoperability (WIPI). The original idea behind WIPI was to give interoperability to mobile content providers. Prior to its introduction, SK Telecom was using its own virtual machine (VM), KTF was using Qualcomm’s Brew and LG Telecom used Java. Under those circumstances content providers had to develop three separate versions of their applications. While WIPI solved that problem, it was still only a Korean standard, and it formed a barrier of sorts to entry into the Korean mobile market by Apple and Blackberry.

Korean consumers, especially the younger ones, took note of the iPhone and its cousin the iPod Touch. In the two years before the iPhone formally entered the Korean market, the iPod Touch flew off the shelves of Apple’s outlets in Myeongdong, a fashionable district of central Seoul. Well over a million of these enhanced MP-3 players were sold and many customers installed Skype on them and either used them in one of Korea’s many WiFi hotspots or paired them with one of Korea Telecom’s eggs. The Egg is a small battery-operated portable device that provides a wireless broadband (WiBro) signal and virtually transforms the iPod Touch into a telephone, at least for those willing to use Skype.

\textbf{Why Was the Mobile Broadband Era Delayed?}

Why did Korea, possessing some of the world’s most advanced digital networks, delay its acceptance of the iPhone and therefore the introduction of the mobile broadband era? The answer to that question sheds considerable light on strategic restructuring of the nation’s telecommunications sector early in the new millennium.

The first reason for this ironic situation is that Korea’s major mobile service providers feared a disastrous loss of voice revenue if the market were opened up to the iPhone and other smart phones. South Korea’s service providers were not alone in this concern. The soaring popularity of Skype and other voice-over internet protocol (VOIP) services sent a warning signal to service providers in Europe, North America and the rest of the world. If smart phones were allowed

into the marketplace, it would virtually destroy the existing business model which relied heavily on voice revenue. As already noted, the popularity of Apple’s iPod Touch among Korean youth underscored that point. To protect their voice revenue, SKT reportedly insisted vigorously that Samsung Electronics and LG not include Wi-Fi capability in the mobile handsets they manufactured for SKT’s services. Likewise, to protect revenue from their NATE service, SKT would have little interest in opening up web surfing and web-based applications to their users.

Korea’s handset manufacturers, led by Samsung and LG, were in a different position, having established themselves as major players in the international handset market. Moreover, both of these chaebol corporations were founding members of the Open Handset Alliance that backed the Android mobile OS platform. However, all of the major handset manufacturers had developed very close relationships over the years with Korea’s mobile service providers. Nonetheless, Samsung and LG are both global companies with major stakes in the mobile handset business. The business press has speculated that a recent shakeup within Samsung Electronics may have been partly motivated by the impact of Apple’s iPhone.

Finally, the role of the government must be assessed in order to answer the question of why smart phones were late in coming to the Korean market. The answer here becomes more complex. However, it seems more than coincidental that the launch of the iPhone came during a presidential election year in South Korea and at a period when communications convergence was exerting great pressure on the policymaking process. Moreover, the newly elected government of President Lee, Myung Bak eliminated the MIC, which had been the leading ministry for telecommunications policy, and the Ministry of Science and Technology. These moves were accompanied by the establishment of the Blue-House appointed KCC. Taken together, these sweeping changes gave great discretion to the private sector, both mobile service providers and handset makers, for a period of months while the new administration was being formed and preparing to pursue important policies.

Restructuring Mobile Communication and Shaping Future Networks in Korea

The reaction of South Korea’s telecommunications sector to the arrival of the iPhone helps to clarify the relative roles of the private sector and the government in this latest restructuring of telecommunications services here. As we have

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288 James F. Larson interview with Kim Shin Bae, CEO of SK C&C.


already noted, consumer demand for the iPhone was very high more than two years in advance of its arrival in the marketplace.

From a strategic restructuring perspective, the introduction of digital mobile communication in South Korea bore many of the hallmarks of earlier developments in the 1980s and the introduction of fixed broadband service, including a healthy degree of competition by multiple private companies to provide the nation with mobile communication service. With respect to two of the key balances in government policy, we might observe the following. First, the balance of government or public initiative versus private has see-sawed in both directions over the past three decades. Government initiative as the MOC prevailed in its debate with MOTIE was critical to the decision to adopt CDMA as a national mobile standard. Yet by 2007, the year Apple introduced its iPhone in the U.S., a presidential election took place in Korea and with it, sweeping change in telecommunications policymaking. From 2007 well into 2008 it seemed that industry gained the upper hand, as Korea’s mobile service providers and handset manufacturers protected their existing market share. Then, once the new government of President Lee, Myung Bak settled in, the KCC issued several rulings that cleared away several barriers to the iPhone and ultimately the growth of mobile broadband.

Second, the role of foreign influence in policymaking within Korea was undeniable, although that influence took place more through the internet and public communication channels than through behind-the-scenes trade negotiation. The mainstream media in Korea, attuned as they were to the nation’s IT successes of recent years, began reporting more intensively on the success of the iPhone, along with Samsung and LG’s exports of Android handsets. Over time, this brought pressure upon Korea’s manufacturers and mobile service providers, along with its government, to open up the mobile market.

**Mobile, Immersive, Interactive Entertainment**

Korea’s strong position in the online game industry has direct implications for the future of mobile communications on the peninsula. As Noam²⁹¹ has noted, digital convergence is bringing about a switch-back from the well known “Negroponte Switch” of digital lore. Nicholas Negroponte of MIT’s Media Lab, popularized the observation that traditionally voice telephony had run over landlines and mass communication like television traveled over the air to viewers. He noted that this was rapidly changing. Telephony around the world was migrating to mobile wireless, while television moved in the opposite direction to cable landlines.

In Korea, and some other countries, the switch noted by Negroponte is reversing itself. Already here, during some hours of the day, more people watch television

DMB) on mobile handsets than over conventional TV sets. Although some people may still think that viewing television on a mobile handset is inferior to watching it on a large screen, future developments in displays for mobile devices will deepen the quality of the image. For example, future mobile displays may utilize eyeglasses or other devices that provide large, realistic, “heads up” displays. It is even possible that wireless television will become superior to stationery wired TV in its visual and immersive experience and intensity.292

Another degree of intensity is added to the equation when we consider future mobile versions of multiplayer online games which are so popular in Korea and such an important export category for this nation. The game industry in South Korea really started its development in 1999. At that time, PC Games, online gaming and mobile games started to develop independently of the previously existing arcade games. A leading analyst of South Korea’s game industry now believes that one of the biggest changes on the horizon for the game industry is a move toward mobile games.293 A major reason for this impending change is the opening up of a new distribution channel with the arrival of fast internet access on mobile phones. The forthcoming introduction of the Apple iPhone, Google Android phones and more generally the increase in smart, broadband equipped handsets may bring about a sea change in the market for mobile games. The arrival of the web-to-phone distribution channel means that the major challenge for mobile games will be formatting them to work well on the smaller screens of mobile devices.

Currently mobile games occupy only a small fraction of the overall game market in South Korea and there is a markedly greater use of mobile games by women than by men. Casual games, web board games, sports games and management/construction/nurturing games are among the most popular genres.294

In 2006, mobile games, along with online games, were a driving force in South Korea’s thriving domestic games market. Sales of mobile games increased by 23% over the previous year, reaching more than 239 billion won. As of 2006 there were an estimated 200 mobile game content providers active in the Korean market.295 There were more rated mobile games on the market in 2006 (1,060) than rated online games (818), reflecting the greater cost involved in developing online games.

In early 2009, a senior manager of a Korean company selling mobile multiplayer role-playing games said that revenue from post-sale micro transactions was being generated at rates as high as 90% of a title’s initial sales. Senior Manager Joony Koo of the mobile game publisher Com2uS said that his company is looking to include micro transaction support in more of its games in 2009, with a particular emphasis on encouraging players to buy virtual goods that help foster a sense of community among players. Virtual goods can be shared among a group of players in various ways. For example, in a multi-player homerun derby game, such items as bats, clothes, helmets and baseball stadiums can be purchased and sent to friends. Com2uS was developing a MMPORG for the iPhone and iPod Touch that would support micro transactions through a built-in system if approved by Apple.

The importance of the game industry to Korea can be seen by looking at its share of content-related exports. As of 2009, it accounted for approximately half of all Korea’s cultural content exports. We explore this topic in greater detail in Chapter 9.

**Fixed, Mobile and Nomadic Access to Broadband**

In its recent survey of broadband around the world, the Berkman Center at Harvard distinguished between fixed, mobile and nomadic access. Fixed networks, of course, are based primarily on fiber optic cables. By mobile, they referred to networks that evolved from cellular telephones, primarily 3G networks. By nomadic, they meant various versions of Wi-Fi hotspots.

The Harvard study found that, in many countries around the world, nomadic access has developed with little support from policy. An example of this in Korea would be the free wi-fi access offered at Starbucks coffee outlets which have proliferated around the country. Nomadic access is offered by fixed broadband providers who seek to make their networks more flexible, as in the case of KT’s Nespot service, by mobile broadband providers who seek to increase the utility of their networks to their subscribers, or through public efforts to create connected public spaces. Clearly, nomadic access plays a role in the effort to eventually provide seamless, ubiquitous access, without undermining competition.

The Berkman Center study suggested that mobile and nomadic access to broadband are important independent measures of performance toward the goal of providing next generation ubiquitous, seamless connectivity. The need to measure both was originally raised in the U.S. by those who thought it would

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297 *Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world*. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 13.
rank higher if both nomadic and mobile connections were included in measuring broadband penetration.  

As of 2009, South Korea had approximately 13,000 Wi-Fi hotspots, the seventh largest number in the world. The majority of these were accounted for by Korea Telecom’s Nespot service.

**Ubiquitous Mobile Networks**

In large part because of the phenomenon of digital convergence, any discussion of mobile communications leads logically to questions about next generation networks and the shape of the future ubiquitous network society. As network devices, including those with various types of sensors, become smaller and smaller, the possibilities for building ambient intelligence into human environments increases. In this new, highly networked environment, mobile handsets and other mobile devices will play a key role.

As Figure 5.2 shows, convergence is expected to eventually link all wireless networks through an IP based Unified Core Network.

FIGURE 5.2 ABOUT HERE

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298 Next Generation Connectivity: A Review of Broadband Internet transitions and policy from around the world. The Berkman Center for Internet and Society at Harvard University, October 2009, draft, p. 39.

Mobile phones and the internet have already permeated all aspects of human life here in Korea and the nation is looking toward the next stage in which there will be a new world of networked and interconnected devices that provide relevant content and information, regardless of where the user is located. The convergence of broadband internet and ubiquitous networks with current mobile services may, as the ITU notes, emerge as the key means of providing communication and monitoring capabilities to users.\textsuperscript{300} Indeed, early experience with the iPhone and Android handsets suggests that their appeal to customers comes in large part from location-based services, “augmented reality” and other services that make use of intelligence in the human environment. Such a ubiquitous network environment is the focus of the following chapter.

\footnotesize{\textsuperscript{300} http://www.itu.int/osg/spu/ni/ubiquitous/}
Chapter 6: Intelligent Buildings, Sentient Cities and the Ubiquitous Network Society

In 2006 the Korean government approved and announced the U-Korea Master Plan. It was the first such plan by any national government in the world and it stated the ambitious goal of making the nation the world’s first ubiquitous society. The plan was issued by the Prime Minister’s office and carried the imprint of the Ministry of Information and Communication (MIC), a sign that the ministry had reached the zenith of its power and influence.

The vision of a ubiquitous network society conjures up a future world in which information can be accessed from anywhere at any time by anyone and anything. As one study put it simply, “The ‘ubiquitous network’ is a network environment in which persons and objects are always connected.”

It is made possible by digital networking and from that standpoint it is inexorably the next step in building an information society. In the early years of the 21st century, Korea and Japan were the two leading examples of nations pursuing ubiquitous networks.

The release of Korea’s master plan signaled to the whole world that the nation was willing to continue building the information society with massive, long-term investments in communication networks and infrastructure. The ubiquitous society will involve building ambient intelligence into all parts of the human environment, including housing, the workplace, transportation systems, health care, and recreation. Ambient intelligence envisions an era in which small computing and sensing devices are built into everyday objects and materials and are networked so that they can communicate with each other and with the internet. This opens up a fascinating range of possibilities for the future, in which some sort of mobile computing device might play a key role, allowing individuals to communicate with and control the objects and machines that surround them.

This chapter describes Korea’s plans for the ubiquitous network society. It begins with a discussion of digital convergence, as the underlying process leading toward ubiquitous networking and ambient intelligence. The second section of the chapter looks at global developments in this area, positioning Korea within them. The third part of the chapter lays out the basic elements in the U-Korea Master Plan, as announced in 2006. That is followed by an exploration of the New Songdo City development in Incheon, the nation’s most prominent effort to demonstrate the commercial viability and human value of ubiquitous networking. Finally, the chapter concludes with some comments on Korea’s most recent strategic restructuring in the ICT sector and where it is heading.

From Convergence to Ubiquitous Networks

Convergence is a complex, multi-faceted process at the heart of digital development today, in Korea and globally. With today’s trend toward cloud computing, convergence means that a user can access and work on the same

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information, in the form of video, documents, spreadsheets or e-mail from a variety of devices, in any location and while moving. To explain how convergence is leading toward pervasive or ubiquitous networks, it is helpful to think of it in terms of the media, technologies, and industries.

**Media Convergence**

One of the most common perspectives on convergence today is that of media convergence. It includes the widely discussed merging of broadcasting and print media on the internet, but also deals with all aspects of the media and human communication.

- Sources
- Channels
- Content, and
- Audiences
- Effects

Convergence affects all media, including the so-called “new” digital media. Take for example internet television. As Gerbarg and Noam put it “Internet television is the quintessential digital convergence medium, putting together television, telecommunications, the internet, computer applications, games and more.”

As they point out, there is no generally agreed upon definition of the new internet television, which is being called IPTV in South Korea. At the lower end of complexity this could refer to a narrow-band, two-way internet style asynchronous channel that accompanies regular one-way synchronous broadband broadcast TV or cable. At the other end of complexity would be a fully asynchronous two-way TV, with each user receiving and transmitting individualized TV programs, including direct interaction in the program plot line. Beyond providing simple viewer choice and control, internet TV will soon enable and encourage new types of entertainment, education and games that take advantage of the internet’s interactive capabilities.

Another good example of media convergence is the convergence of the internet with both fixed line and mobile telephony as illustrated by voice over internet protocol (VOIP) telephone services such as Skype. The popularity of Apple’s iPod Touch with Korean young people in 2007 and 2008 was in part fueled by user interest in Skype, the free VOIP software that could be loaded and used within Korea’s WiFi hotspots.

Media convergence itself only begins to touch the breadth and depth of the phenomenon. It is a broad and complex process that extends well beyond the media to the convergence of IT with other technologies and industries.

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IT Convergence with Technologies and Industries

Korea and the other technologically-advanced nations are now challenged by the future multilayered convergences of ICT with bio, nano, and green technologies as well as convergence with many industries. In January of 2009 the Korean government, through the Knowledge Economy Ministry, announced its intent to focus on IT convergence with five industries – automobiles, shipbuilding, machinery, textile and medical services. It officially launched the industrial IT convergence forum where experts from these five key industries would participate.304

The transformation in medicine and health care is an instructive example. The first technological revolution in modern biology started when Watson and Crick described the structure of DNA half a century ago. The sequencing of the human genome a decade ago set off a second revolution which has begun to illuminate the origins of certain diseases. Today, many industry observers are convinced that a third revolution is underway, involving the convergence of biology and engineering. This convergence is led by information technologies through the digitization of medical records and the establishment of an intelligent network for sharing those records. That essential reform should spark other technological changes, boosting research on drugs and the ability of not only physicians, but patients, to share information with one another.305

Various industry studies in markets like the United States, which spends about 16 percent of its GDP on health care, suggest substantial savings from the digitization of health care records. Already, such efforts by Kaiser Permanente have resulted in substantial savings and improvement in efficiency.306

Another powerful illustration of the convergence of IT with medical science is found in the field of genomics. At the point when the cost of sequencing the human genome reaches a low enough level, many suggest that the possibilities for personalized medical care open up. Today improvements in gene sequencing machines, borrowing from techniques in semiconductor manufacturing, have improved even faster than microprocessor performance.

IT is also converging powerfully with nanotechnology. Actual development of the field of nanotechnology owes a great deal to the information revolution and the semiconductor industry. In particular, miniaturization, took place in that industry before others.

In late 2009, the President of the International Astronautical Federation suggested that South Korea could leverage its strength as a world leader in IT to create a niche in the global space industry. He noted that information technology

is becoming more important to the space industry along with greater international cooperation and the broad effort to replace existing solutions with cheaper and more effective alternatives.\textsuperscript{307}

In summary, convergence is a complex, multifaceted process involving virtually all industries and technologies. It is also a process in which information and communication technologies and digital development are a driving force. We turn now to the next logical stage in this process.

The Ubiquitous Network Society

The concept of a ubiquitous network society is closely related to that of ubiquitous computing, also referred to as pervasive computing or ambient intelligence. Ubiquitous computing is a model of human-computer interaction in which information processing has been thoroughly integrated into everyday objects and activities. It envisions small, inexpensive, robust networked processing devices, distributed at all scales throughout everyday life and generally used for common-place ends. For example, a home ubiquitous computing environment might interconnect lighting and environmental controls with personal biometric monitors woven into clothing so that illumination and heating conditions in a room can be continuously and imperceptibly modulated.

Mark Weiser, who was Chief Technologist of the Xerox Palo Alto Research Center (PARC) coined the term "ubiquitous computing". He noted that "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it." The idea was that intelligent interfaces can make computers simple to use, while communication networks would connect devices for use, anyplace anytime. As a 2006 ITU report noted, "Tomorrow’s ubiquitous network will map objects and activities in the real world onto objects and activities in the virtual world."\textsuperscript{308}

The Global Context

The convergence of technologies and industries that is at the heart of today’s information revolution is inherently global in scope and poses crucial challenges for the domestic and global governance of ICT infrastructure. As Cowhey and Aronson note\textsuperscript{309} there are at least four reasons why the domestic governance of ICT infrastructures depends on global arrangements. First, network externalities ensure that networks are more valuable when they connect to more users. As mentioned in earlier chapters, this is sometimes referred to as Metcalfe’s Law.


\textsuperscript{308} “Ubiquitous Network Society” Briefing Note, ITU Telecom World 2006, Hong Kong, December 4-8, 2006.

and means that the value of the internet is exponentially related to the number of its users. Second, economies of scale apply to the engineering and economics of networks, inviting the growth of regional and global suppliers whose fate depends in part on rules governing provisioning of the networks. Third, a number of unusual strategic dimensions arise because of the particular features of network economics. Fourth, concerns over sovereignty issues make it likely that the public holds government responsible for the quality of networked infrastructures. The political leadership encourages this equation, so the national control of networks becomes highly political. This in turn has major consequences for the performance of networks.\textsuperscript{310}

Cowhey and Aronson describe a political economy of global governance of the ICT infrastructure in which the most powerful markets will tend to get their way. They assert that the United States, historically the market leader, will likely retain its leadership position until 2025. In their view, power, technology, ideas and domestic politics will all play a role in future governance. While we do not take issue with them, our point here and in later chapters is simply that South Korea, by dint of its accomplishments, now sits at the table with the U.S. and other advanced ICT economies when it comes to decisions about the future. Put otherwise, South Korea’s market power in ICT should give it a voice far larger than its population or certain other measures would indicate.

**Korea’s Plans and Policies for Ubiquitous Networks**

Korea’s interest in ubiquitous networking was first broadly articulated in the IT 839 initiative introduced by the Ministry of Information and Communication in 2004. It outlined ambitious goals for eight services, three infrastructure technologies, and nine product categories. The eight new services were portable Internet (WiBro), mobile television (DMB), home networking, vehicle-based information systems (telematics), radio-frequency identification (RFID) technology, W-CDMA mobile telephony, digital television broadcasting and voice-over Internet protocol (VoIP) services. The advanced network infrastructures were the broadband convergence network, sensor-based computing networks, and the next generation internet platform IPv6. The new products were mobile handsets, digital televisions and broadcast devices, home network equipment, system-on-chip products, next-generation personal computers, embedded software, digital content and solutions, vehicle-based information equipment and intelligent robots.

The specific goals of the IT 839 initiative showed that the MIC and the government were aware of the approaching era of ubiquitous networking. In fact, in 2006 the government streamlined the long-term plan and re-named it the u-IT

However, in May of that year, the government also released its pathbreaking U-Korea Master Plan.

**The U-Korea Master Plan: To Achieve the World's First Ubiquitous Society**

Prime Minister Han, Myeong Sook’s introduction to the U-Korea Master Plan made clear the ambitious character of Korea’s hopes. In it, she said “The successful implementation of the u-Korea Master Plan, the new blueprint of Korea’s informatization, will create the world’s first ubiquitous society and achieve an advanced Korea.”

The nation’s leaders were well aware that other countries were strategically approaching ubiquitous IT, drawing on their own strengths and unique environments. These included the Network and Information Technology Research and Development (NITRD) Program in the US, i2010 in Europe and the New Industry Promotion Strategy in Japan. The u-Korea Master Plan noted the developments in artificial intelligence, home networks, home-robots, u-post office and u-logistics based on RFID advances. It concluded that “The characteristics of ubiquitous IT—convergence, artificial intelligence and real-time—are the most effective means to upgrade the operating system of the country and to resolve the full range of social, economic and administrative issues.”

**The Issues Korea Confronted**

The plan addressed key national and international issues. Notably, in a section titled “Current Issues and Contributions of u-IT” the report stated that “New social environments need to be created for a unified Korea together with the expansion of free trade based on the promotion of joint economic zones and improvement of economic cooperation between the two Koreas.”

The same section of the plan referred to South Korea’s “nutcracker” condition in which high tech competition with advanced countries and price competition with developing countries like China was squeezing it just like a nut in a nutcracker. It noted that the technology gap with China, which had been the major export market for Korean IT products, was gradually narrowing. However, it followed that observation with acknowledgment that “The focus of the world economy is moving away from the U.S. as the Pan-Yellow Sea Rim Economic Forum has materialized and the East Asian economic zone, triggered by the rapid growth of China, has emerged.” It went on to suggest that “Strategies to lead the East

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312 U-KOREA Master Plan To Achieve the World’s First Ubiquitous Society, Ministry of Information and Communications, Republic of Korea, May 2006.

313 U-KOREA Master Plan To Achieve the World’s First Ubiquitous Society, Ministry of Information and Communications, Republic of Korea, May 2006, p. 3.

Asian economy should be formulated to prepare for the era when Asia would be the center of the world economy.

This report also explicitly acknowledged the serious threats posed by global warming and threats to the natural environment, noting that “Mass production and mass consumption destroy the natural environment, and depletion of natural resources and environmental pollution break the balance of ecosystems, threatening the survival of human beings.” In underscoring this point, it noted that “Intensive environmental monitoring and regulating lead to high added value for environmental industries.”

The report also acknowledged that there was a growing gap in the amount spent on education between high and low income consumers and that this was one factor contributing to conflicts between regions, social classes and generations.

Finally, the report noted that Korea’s society was aging more rapidly than other advanced economies. As Korea becomes a “super aged society” it noted that welfare for the elderly, contraction of the economically active population and inter-generational conflicts might become social and economic problems.

The U-Korea Vision and Goals

The vision of the u-Korea Master Plan is to transform Korea into an advanced country by realizing the world’s first ubiquitous society based on the world’s best u-infrastructure. The plan sets forth goals in terms of advancing in the following five areas.

- Friendly government. This goal is to actively answer the administrative needs of the public and to simplify civil service processes.
- Intelligent land. The main element here is to bring intelligence into all national infrastructure facilities.
- A regenerative economy. South Korea wants to achieve a per capita income of $30,000 by developing the new market for ubiquitous IT and strengthening the competitiveness of existing industries through ubiquitous informatization.
- A secure and safe social environment. This goal is to be accomplished through security and environmental systems based on ubiquitous IT.
- Tailored u-Life services. This refers to providing more convenient and affluent living conditions by delivering customized and autonomous services based on advanced intelligence systems.

Advancement in the five areas outlined above would be accompanied by optimization of four engines. The first of these was balanced global leadership, or the u-Globalization engine. South Korea sought to exert such leadership as are appropriate to the country’s image as a global IT leader. To accomplish this goal the plan called for aggressively entering overseas markets to establish u-Korea as the national brand. This market entry would include pilot projects to

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connect industrial clusters at home and abroad, the selection of promising products for next generation export.

Second, it aimed to establish an ecological infrastructure and to allow viable industries to take root. This goal sought to prevent an unreasonable rush for industry development.

Third, the plan sought to streamline social infrastructure. It wanted an efficient and flexible infrastructure for seamless provision of various ubiquitous services.

The fourth goal was a transparent technological infrastructure. This was an environment in which IT and other technologies such as bio, nano, space, cultural and environmental technology could converge to create synergistic effects.

**The U-Cities Movement**

There are efforts underway around the world, including Singapore, Hong Kong, Dubai and several European cities to introduce state of the art technology into urban development to create digital or wireless cities. Around 2005, many local governments in Korea began applying this concept to urban development.

In February of 2006, the Ministry of Information and Communication and the Ministry of Construction and Transportation signed an MOU on the u-city project. That project was aimed at building industry-wide partnerships between the high-tech and construction sectors to integrate advanced IT infrastructure into the construction of sustainable cities. Under the MOU, the two ministries agreed to cooperate in such areas as

- Enactment of regulations for the construction of u-cities,
- Development and certification of a standardized u-city model,
- Promotion of u-city pilot projects,
- R&D development of u-city related technologies, and
- Discovery and promotion of u-city related subjects.

In addition, the two ministries agreed to exchange information and personnel and to undertake international activities for global standardization and advancement into international markets. Under the MOU, they agreed that Korea would push ahead with its nationwide u-cities plan. Several city governments, including Seoul, Busan and Incheon, expressed their intent to independently pursue u-city development and all six regions in Korea had plans to invest in their own u-city projects. In 2007 Korea passed a law on the construction of u-Cities, allowing the central government to have some policy influence on the diverse local efforts.

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The Busan u-City project achieved a major milestone in mid 2009 when it completed installation of a Firetide infrastructure mesh to enable wireless communication anywhere in the city via a mobile device (smart phone, PDA or notebook). Completion of the project by Korea’s second largest city meant that visitors and local vacationers would have ubiquitous access to public internet data and media applications, as well as to a custom online visitor portal, no matter where they were located in the region.\(^{318}\)

**New Songdo: Korea’s Brand New Ubiquitous City**

New Songdo in Incheon aims to be the world’s first entirely new ubiquitous city, built from scratch. Rising up on almost 1,500 acres of reclaimed land off the coast of Incheon, it is a one of the largest planned city projects ever undertaken anywhere in the world.

New Songdo is a joint venture of Gale Company, and American developer, and POSCO E&C, a subsidiary of South Korea’s large steel company. The city includes a convention center, a 65-story trade center, a Jack Nicklaus-designed golf course, and a central park, similar to New York that incorporates a system of canals using filtered sea water. When completed in 2014 the new city will be home to some 65,000 people and a workplace for over 300,000.\(^{319}\) However, what really distinguishes New Songdo from other planned cities is the effort to build ambient intelligence into the city right from the start.

In this ubiquitous city, all major information systems for government, residential, medical, business and educational were built into houses, streets and office buildings. Since the underlying technologies for ubiquitous networks were rapidly changing, this amounted to an open-ended effort to build in as much ubiquitous communication capability into the city as possible right from the start. To ensure that Songdo would have access to the latest in RFID technology, the Ministry of Information and Communication earmarked $297 million to build an RFID research center in the city.\(^{320}\)

New Songdo assumes special prominence among Korea’s u-city projects for several reasons. First, it is an integral part of the Incheon free economic zone (IFEZ) which includes Korea’s new Incheon International Airport. The entire zone is about a third the size of Singapore, 2.5 times the size of Manhattan and more than 70 times the size of Yeouido in Seoul.\(^{321}\) With the planned installation of

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high-speed rail connections to Seoul, Incheon becomes part of the greater Seoul area. Second, the airport and the FEZ are the closest ones to South Korea's big cooperative industrial project with North Korea at Kaesong. The longer term vision of Korea as a hub in Northeast Asia contemplates a unified Korea. Third, as noted already, New Songdo, unlike existing cities, presents an opportunity to build in ambient intelligence from scratch. Finally, New Songdo has particularly ambitious goals to become a global educational and research hub for the 21st century.

The central government’s commitment to the New Songdo project to date seems clear and unwavering. From 2005 to 2009 the IFEZ authority attracted six different investments from central government ministries and agencies totaling US $12.4 million. These included the u-Safety project, launched by the Ministry of Land, Transport and Maritime Affairs, which installed a wireless mesh CCTV system as a model project for cities and provinces around the country. The Incheon Free Economic zone is one of six such zones in Korea. The others are Busan and Gwangyang, designated in 2002, a western coastal area in North Jeolla province including the cities of Pyongtaek and Dangjin, the Daegu area in North Gyeongsang province, and the Saemangeum-Gunsan zone in North Cheolla province.

The 2002 law on the Designation and Operation of Free Economic Zones effectively granted foreign firms special legal status, exempting them from a range of labor-related requirements. It also marked the start of foreigner-friendly facilities such as special clinics and pharmacies. Moreover, it stipulated the legal enforcement of English as one of the official administrative languages within each of the zones.

In 2009, the Ministry of Knowledge Economy adopted a promotional logo for the six free economic zones to help promote foreign investment in those areas. At the same time, it announced that development of all these zones would be completed in the 2020 to 2030 time frame.

**Incheon as A Regional Hub**

The full significance of New Songdo can only be grasped as part of the overall plans for the Incheon Free Economic zone. At the broadest level, the aim is to make Incheon a global hub for (1) communications (2) sea and land transportation and (3) air transportation. A glance at Figure 6.1 shows the overall

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regional logic. Korea is situated between the other two largest Asian economies in the most economically active area of the world.

INSERT FIGURE 6.1 ABOUT HERE
One of the most spectacular features of this hub and tri-port strategy is the new 21.38 kilometer long Incheon Bridge which soars over the West Sea, connecting New Songdo with Incheon International Airport. The bridge is a critical element in the future success of New Songdo, allowing a fifteen minute drive from the airport for tourism, logistics and all sorts of activities. It is the world’s seventh longest such structure and was dedicated by President Lee Myung Bak in mid-October of 2009.  

**Songdo as a Test Bed**

New Songdo will offer a chance to study the large-scale use of RFID, smart cards and sensor-based devices even as Western societies lag in this next wave of computing. The technology infrastructure will be built and managed by Songdo U-Life, a partnership of New Songdo City Development and the South Korean network integrator LG CNS, which is recruiting foreign information-technology companies as partners.

B. J. Fogg, director of the Pervasive Technology Lab at Stanford University said that "New Songdo sounds like it will be one big Petri dish for understanding how people want to use technology. This is a competitive advantage for the Koreans. They will know before anyone else what flies."  

Culturally speaking, the New Songdo project draws heavily on Korean expectations of less privacy than in Western countries and on the willingness of people to quickly embrace new technologies. These cultural factors may allow Korea to take the lead in ubiquitous networking technologies and to set standards.

**Education in New Songdo**

No other area underscores the ambitious goals of the New Songdo development better than its plans for education. One of its aims is to establish an industrial and research cluster to foster innovation.

The Korean government invited ten international universities, mostly from the United States, to set up branch campuses as part of a single Global Campus in

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New Songdo. To emphasize the seriousness of its invitation, it offered US$ 1 million to each school for planning purposes.

The first U.S. university to announce plans for a branch campus in New Songdo, was Stonybrook University. In December of 2008 it signed a fund support agreement with the Incheon FEZ and began planning for a campus of about 1,500 students, with programs in engineering, business and technology.330

Yonsei University has traditionally been one of South Korea’s most international universities. It was the first to develop a large international division, and the first to create a graduate school of international studies. In 2006 Yonsei launched the Underwood International College, the most significant commitment by a Korean university to date to a four-year, English only undergraduate program with the aim of attracting students from around the world and producing global leaders.

Also in 2006, Yonsei University reached a final agreement with the Incheon Metropolitan City Government to build a new global academic complex. The first phase of the complex included a 228 acre campus with a residence college for freshmen and a university global village, intended to improve the living environment for distinguished foreign scholars. In a second phase beginning in 2011, Yonsei planned for a science park, an international college and an international space technology research center as a joint effort with the Harvard Smithsonian Center for Astrophysics.331

**Private Sector Investment**

One of the goals of the New Songdo development is to establish a state of the art industrial cluster. This is aimed at establishing a virtual knowledge ecosystem ranging from R&D to commercialization to reinvestment. The strategy is to build organic linkages among domestic and foreign businesses, universities, think tanks and support agencies.

The IFEZ is already operating a Radio Frequency Identification/ Ubiquitous Services Network (RFID/USN) Center, jointly funded by the former Ministry of Information and Communication and the Incheon Metropolitan Government. About 24 international and Korean RFID technology developers are associated with the Center, including Alien Technology, the world leader in RFID. In December of 2006, Alien announced the formation of Alien Technology Asia, based in Songdo, to serve rapidly expanding markets for RFID in Asia. In its decision to locate in Songdo, Alien Technology considered the advanced stage of the RFID market in Korea, technology capability, leadership and vision.332

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New Songdo also attracted a contribution of $450,000 from IBM to help establish a bio-research complex with a goal of becoming Asia’s leading bio-research center. That project also obtained a long-term loan worth US$20 million, a W30 billion (US$24.3 million) joint research project with IBM Watson-Almaden Research Center, and an investment of more than W300 billion (US$243 million) from the Gachon Gil Foundation.

In April of 2009 Gale International and Cisco signed a framework agreement for establishment of the Cisco Global Center for Intelligent Urbanization. It is Cisco’s first center focused solely on intelligent urbanization and was located within the Northeast Asia Trade tower, a 65-story building that is one of New Songdo’s landmarks. Cisco’s new global initiative was designed to help cities around the world use the network as the next utility to optimize their long term growth.

A key feature of intelligent urbanization is the ability to make buildings “green aware.” “The intelligent building gathers, analyzes, and displays real-time building energy use and employee resource-consumption data. By displaying real-time building information such as power consumption, CO2 emissions and water usage on Cisco’s digital signage solution, Green Aware is designed to drive a change in user behavior by arming consumers in Songdo IBD with information to help them become environmentally conscious and contribute to the sustainability of their surroundings.”

Promoting the Ubiquitous Network Society

Like the concept of “information culture” the idea of a ubiquitous society became a promotional theme for the private sector, government, the education sector and the media. Various efforts to explore, plan for and promote ubiquitous networking became so pervasive in South Korea that here we can touch on only a few prominent examples.

U-Seoul Forum

In June of 2008 a U-Seoul Forum was established. As of mid 2010, the forum had 702 members, including university professors, research institute staff, and representatives from industry and community organizations. The purpose of the U-Seoul Forum was to explore and suggest methods for building a ubiquitous Seoul. The founding goals of the U-Seoul Forum were stated as follows:

- To create an organic network of corporate, academic, research and government cultures for the purpose of information exchange. It includes

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334 The Forum was established on June 2 and Dr. Oh, Myung was elected as its first chairman. “Korea’s Early IT Leaders Support U-Korea Business and Create New IT Model,” [Electronics Newspaper](http://english.etnews.co.kr/news/detail.html?id=200806160009), June 16, 2008.

335 From Korean-language web page. [http://usf.seoul.go.kr/member/member_list.jsp](http://usf.seoul.go.kr/member/member_list.jsp)
specialists in the rapidly changing era of information culture and those who are interested in it. (A human network of specialists in ubiquitous networking including government officials, professors, research institute staff, corporate employees, and city employees.)

- To introduce to each other those who are promoting the ubiquitous enterprise in the city of Seoul and to build in this city a plan for cooperation and collaboration.
- To prepare a grand dialogue where specialists in ubiquitous design, traffic, and welfare and other areas come together in one place and collaborate to discover this new enterprise. 

Ubiquitous Exhibits in Seoul

Several areas of Seoul have installed media to promote the ubiquitous society, while helping acquaint citizens with some of its features. The Kangnam district south of the Han River has installed 12-meter tall poles along what officials call U-street. Installed in March of 2009, there are 21 of these poles along a major road near the Kangnam Subway Station. They allow people to search maps, read the news and check transportation information. The area around the poles is also a free Wi-Fi hotspot. They provide services in English, Chinese and Japanese and also include a service for sending photographs and for playing casual games while waiting for transportation.

In June of 2007 the National Information Society Agency announced that Cheonggyecheon, the highly successful stream renovation project in central Seoul would be made into a ubiquitous ecological stream with the help of Samsung SDS. In May Samsung disclosed that a research project to create a “u- Cheonggyecheon” had been made part of Seoul City’s roadmap for the u-Seoul master plan.

Samsung used several ubiquitous technologies for this project. An independently developed “UbiCenter” platform would be used to control the water level in times of torrential rain and water quality sensors were used to detect the inflow of contaminants in advance in order to maintain water purity. A viewing system was also installed to enable citizens to view Cheonggyecheon’s underwater ecosystem. In addition, Samsung provided systems and features to

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338 The Cheonggyecheon project was a major hallmark of Lee Myung Bak’s term as mayor of Seoul. It removed an old overpass and all of the concrete that covered the Cheonggyecheon stream. The renovation proved very popular with Korean citizens and have received international acclaim.

allow citizens to enjoy the site and its rich history and culture more conveniently.\textsuperscript{340}

Another prominent example of ubiquitous networking is the Digital Media City (DMC) being built within Seoul.\textsuperscript{341} The DMC is a new town development in Seoul’s Sangam area, designed as an incubator for the creation of digital media. It hosts global as well as Korean firms and start-up enterprises. Initially it targeted recruitment of firms creating the technology and content for the media and entertainment industry. However, with the onset of the ubiquitous era, it broadened that to include any enterprises creating or using digital media and software. This included biotechnology, pharmaceutical firms, transportation, corporate consulting, telecommunications service providers and a range of other industries.\textsuperscript{342}

\textbf{Facilitating Convergence: Legal and Regulatory Changes}

The sweeping reorganization of the government by the new administration of President Lee Myung Bak was accompanied by a series of legal and regulatory changes. First, in early 2008 the South Korean government announced plans to encourage media conglomerates by allowing firms to own both television stations and newspapers. After receiving a policy briefing from the Korea Communications Commission, President Lee Myung Bak declared that “The government should create an environment to enable the advent of a world-class media firm with global competitiveness by drastically loosening the strings of regulations on the broadcasting and communications sector.”\textsuperscript{343} Until that announcement the newspaper law prohibited newspapers from controlling terrestrial and cable television stations. Traditionally, the purpose of that law was to prevent media giants from wielding too much influence over public opinion. The same law had also prohibited large firms with assets exceeding $2.6 billion from owning news outlets, but the KCC’s proposed revision would lift that ceiling to $8.77 billion. The Commission’s report noted that the stringent regulations on ownership and multiple ownership prohibit the broadcasting sector from expanding through new investments and mergers and acquisitions.\textsuperscript{344}

Second, in 2008 the Korean government approved a law that would allow providers of IPTV services to include the linear television offerings of existing broadcasters as part of their services. By January 2009, KT, along with SK Telecom and LG-Telecom were all operating in this new market.

\textsuperscript{341}http://dmc.seoul.go.kr/english/index.jsp
\textsuperscript{342}http://dmc.seoul.go.kr/english/jsp/investment/why_dmc.jsp
In a third change, the KCC announced that it would allow private media representatives to sell advertising. This move would do away with the monopoly of the state run Korea Broadcast Advertising Company (KOBACO). Choi See Joon, Chairman of the Korea Communications Commission, was quoted near the end of 2008 as saying “It is obvious that the media industry will go through revolutionary changes next year and in 2010, and it's anybody's guess who will end up as winners or losers as a result of the changes. A larger number of companies, and possibly newspapers, will be able to establish or acquire television stations under the new framework, which would be an important step in expanding the pie of the media industry. If the changes are inevitable, why not let them happen next year.”

As this book is written, one thing seems clear. The reorganization of ICT-related bodies in the government and changes in media law had as one major goal to actively encourage further convergence toward the creation of a U-Korea.

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Chapter 7: Education and Building Citizen Awareness

No other topic resonates as strongly with the title of this book as education, since it provides the building blocks for the information society. Specifically, as the recent World Bank/OECD study of Korea, education helps form the four key pillars of the knowledge economy.

- An economic and institutional regime with incentives for the use of existing knowledge and the creation of new knowledge.
- Education, training and human resource management. (An educated, entrepreneurial population that can both use existing knowledge and create new knowledge.)
- A dynamic information infrastructure, to facilitate effective communication, dissemination and processing of information.
- An efficient innovation system, comprising firms, science and research centers, universities, think tanks, consultants and other organizations.  

From the rubble of the Korean War and half a century of Japanese occupation, South Korea faced the task of re-building its entire system of schools. Lacking natural resources, South Korea turned to education and knowledge as the key engine of economic growth.

In this chapter we explore the critical role of education in South Korea’s digital development. We begin with the story of how Korea built up its formal educational system, and the role of ICT in it. Then we move to the massive, pan national campaigns to promote citizen awareness and ICT training. The final sections of the chapter deal with innovation, research and development and the globalization of education in Korea.

Building the Formal Educational System

When the armistice that ended hostilities in the Korean War was signed on July 27, 1953, South Korea found itself faced with an extraordinary challenge simply to build an educational system. There were two major reasons for this situation. One was the half-century of Japanese colonial rule in Korea, which ended with the end of World War II. The other was the widespread destruction and dislocation of families caused by the Korean War.


The Legacy of Colonial Rule and the Korean War

During Japanese colonial rule in the first half of the twentieth century a comprehensive, modern national system of education was established in Korea. However, the Japanese came as conquerors and two features of colonial educational policy contributed greatly to the anger and frustration that the Korean people felt toward the colonial state.

First, access to education beyond the elementary level was restricted as part of Korea’s subordinate status in the empire. Colonial planners did not see the need for their subjects to learn more than basic reading and arithmetic skills. This restriction on higher education led to a pent-up demand for educational access in Korea that would explode when the Japanese empire collapsed.

Second, colonial education policy used education to indoctrinate Koreans into being loyal subjects of the Japanese empire and later to assimilate them into Japanese culture. This forced assimilation left nationalist anger and demonstrated to Koreans that education could be used as a political instrument by a powerful, centralized state.\(^\text{348}\)

Consider the state of Korean education at the end of World War II in the Pacific which ended Japan’s colonial rule. Only 64.0% of elementary school-aged children were enrolled in school. This percentage plummeted to 3.2% for secondary education and 0.18% for higher education.\(^\text{349}\) One survey estimated that the population of South Korea aged 13 years old and above was 15 million and that 53% of that population (8 million) was illiterate. Those who had a secondary education or more accounted for only 12.6% of the population.\(^\text{350}\)

Faced with this desperate situation, the U.S Military Governance and the Republic of Korea set the expansion of elementary education as their number one task for educational development. This was especially challenging as 68% of the school buildings had been destroyed during the Korean War.\(^\text{351}\) During the war itself, displaced families had set up schools in tents and made an effort to continue their children’s schooling. However, many children were unable to attend school during the conflict itself and thus graduated from high school two years late.

Today’s universal literacy and high levels of educational achievement in South Korea need to be measured against the legacy of colonial education policy and the devastation of the Korean war. Defining universal enrollment as attaining a


90% enrollment rate, Korea achieved universal elementary education by 1957, universal middle school education by 1990, and universal high school education by 1999. It is no exaggeration to say that Korea’s first move in modernization came in education.\textsuperscript{352}

As the nation began to develop, the requirements of industry and government for technically trained people increased, and so did the demand for university level education. Accordingly, enrollment in progressively higher levels of education increased as South Korea moved from an emphasis on heavy industry in the 1970s to electronics and information industries beginning in the 1980s and through the 1990s.

By 2007 Korea ranked fourth among OECD countries, behind the Russian Federation, Canada, and Japan with all four countries having more than fifty percent of the population attain a tertiary degree. Along with Japan, France and Ireland Korea showed a gap of more than 25 percent between the older and younger age groupings, indicating the rapid expansion of tertiary education in recent years.\textsuperscript{353}

\textbf{Korea’s Efforts to Produce Skilled Information Workers}

Strengthening vocational education became a priority in the economic development plans of the 1970s and vocational junior colleges were set up during that decade to supply technicians for the HCI. That plan explicitly acknowledged the need to upgrade technology and the technical workforce. The framework of vocational education was institutionalized in 1976 through enactment of the Basic Vocational Training Act, which was wholly amended in 1981.\textsuperscript{354}

The increased need to provide students with scientific, technological and other skills for the information age is a common denominator among the thirty member nations in the OECD. In a particularly telling statistic, South Korea led the world in 2006 in the proportion of tertiary science graduates in the 25-34 age group per 100,000 employed people in the same age cohort. This measure is one way that the OECD gauges the output high-level skills by different educational systems.\textsuperscript{355}

Part of Korea’s approach to education for the information age has been to change the focus and curricula of its schools at all levels to meet the changing human resource requirements. At the high school level, Korea has general high

\begin{itemize}
  \item \textsuperscript{353} OECD, \textit{Education at a Glance}, 2008, p. 32.
  \item \textsuperscript{354} Suh, Joonghae, and Derek H.C. Chen. Korea as a Knowledge Economy: Evolutionary Process and Lessons Learned. Korea Development Institute and The World Bank Institute, 2007, p. 41.
  \item \textsuperscript{355} Note that this indicator does not provide information about the number of graduates actually employed and putting their skills to work.
\end{itemize}
schools, vocational high schools, science high schools and other specialized high schools. Courses offered at the vocational high schools have recently been diversified to include information technology, robotics, animation, films, cooking, beauty, tourism, horse care and so forth to meet the demands of a rapidly changing industrial society. According to the Ministry of Education, specialized high schools are designed to “identify and nurture students with outstanding ability and aptitude in some particular areas at an early stage to strengthen the national competitiveness.”356 As of March 2006, there were 129 such high schools specializing in nine different areas, which breaks down to six national, 82 public, and 41 private high schools. Today South Korea has several internet high schools and even a Game Science High School. At the latter, students who are admitted complete all of their national high school requirements the first year and spend the next three years working on projects for the game industry.357

Junior colleges, which have mostly two year and some 3-year post-secondary programs, are a direct outgrowth of the increased demand for technical manpower with rapid industrialization. As of 2006 there were 152 junior colleges in Korea, 139 of which were private institutions.358 They had a combined total enrollment of 517,235 students.

A large focus of junior college education is on industry-academia cooperative efforts. These cooperative programs between junior colleges and industries include student internships, industrial field training for junior college faculty, education of industry employees at junior colleges, joint research, exchanges of technology and information, and suggestions for the curriculum by industries. The percentage of junior college graduates who gain employment after graduation has been maintained at 80 percent, higher than that of four year colleges and universities.359

The Ministry of Education administers public universities in South Korea, but the Ministry of Science and Technology over the years has contributed funds to university science and technology programs, both public and private, through the Korean Science and Engineering Foundation (KOSEF), Korea’s equivalent of the U.S. National Science Foundation. As of 1997, KOSEF had established approximately 30 university science and technology centers of excellence, which it funded annually at the million dollar level. Those centers were required to

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357 [http://www.game.hs.kr/](http://www.game.hs.kr/)
collaborate with at least three other institutions and were strongly encouraged to attract supplemental support from industry.\textsuperscript{360}

Centers with the best reputations include the Korean Advanced Institute of Science and Technology (KAIST) and Seoul National University (SNU). Special facilities and training in electronics-related disciplines offered by these two institutions include KAIST's Material Surface Engineering Center, SNU's Research Center for Thin Film Fabrication and Crystal Growing of Advanced Materials, and SNU's first rate facility for teaching semiconductor processing. This latter facility, as of 1997, had equipment comparable to that of UC Berkeley, MIT or Stanford. For example, it had an e-beam direct-write lithography system that routinely processed runs of multiple project chips with designs from other universities.

Of the 150 colleges and universities in Korea, approximately 100 have electrical engineering departments. 70 of those were active in the Integrated Circuit Design Center and at least 40 of them were well regarded by the Korean semiconductor industry for their teaching of IC design.\textsuperscript{361}

South Korea's universities were generally modeled after those in the United States. Like their American counterparts, major private and public universities in Korea have played a major role in basic research and development across virtually all of the major fields of scientific and technological research. University faculty and leading university research institutes in South Korea have strong ties will all of the major governmental and private research institutes. One factor that has strengthened these ties is the predominance of U.S.-trained Ph.D.s in the nation's universities and research institutes.

\section*{The Role of ICT in Korean Education}

While education is undoubtedly a central ingredient in the information revolution, it is also the case that the media and new communications technologies play an exceedingly important role in education. Therefore, beginning in the 1980s when South Korea first began building its digital networks, the networking and computerization of South Korea's schools became a top national priority. Consequently, schools, colleges and universities throughout Korea, along with government organizations, were consistently among the first organizations in the country to enjoy the latest advances in high speed networking and broadband internet as the country built out its infrastructure.

As the nation reached near-universal enrollment at the elementary, middle and high school levels, the placement of computer labs in those schools with high speed internet also helped to minimize the problem of a digital divide. Children

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from families in all segments of society could enjoy the same level of computer and internet education at school.

**The Introduction of Cyber-Universities**

When it came to the introduction of distance learning at the tertiary level, or the so-called Cyber Universities, it came rather quickly and on a large scale. In 2001 and 2002 alone, there were 14 new cyber universities founded. As of 2009 there were 18 Cyber Colleges or Universities in South Korea with a freshman quota for admissions that year of 20,747 students.

As of 2009, online universities enrolled some 88,000 students, or 5 percent of the total number of university students nationwide. Many of the cyber-universities in Korea stressed life-long education and offered courses in such niche markets as IT, real estate, counseling, nursing and education programs for the handicapped.\(^{362}\)

**Informatization in Korea: Citizen Awareness and ICT Education**

The public promotion of internet services and new digital media has played a crucial role in ensuring that South Korea’s new networks are used and are economically sustainable. The full benefits of ICT can only be realized when used for social means. This is the demand-side of the economic equation and it is crucial to the building of an information society. It requires citizen awareness of both the nature of the information society generally, and the uses of specific technologies that come with it.

At each stage of Korea’s network modernization and infrastructure development, there was a broad and sustained emphasis on demand creation and public promotion of the information society. Informatization is to the information revolution what industrialization was to the industrial revolution. As noted by the World Bank Study, promotion of informatization requires both large scale investment and the long-term cooperation of various organizations.\(^{363}\)

Efforts to create such citizen awareness began in the early 1980s and have steadily increased over the years. Indeed, it is precisely the broad public acceptance of information culture, led by the internet that has fueled the rapid development of information technology in Korea. The idea of spreading or inculcating information culture in Korea included

- Changing mindsets and attitudes toward information use
- Developing a sound information environment and information ethics


- Enhancing citizens capabilities to use information
- Spreading an information-centered lifestyle, and
- Establishing relevant laws and regulations.\textsuperscript{364}

In the 1980s, the Ministry of Communications emerged as a highly visible proponent of the information society and importance of information culture in everyday life. As the decade wore on, other ministries, including Science and Technology, and Trade and Industry, also promoted this concept.\textsuperscript{365}

In 1988 an Information Culture Committee consisting of public opinion leaders from various fields was formed and June was designated “Information Culture Month” in South Korea. It was originally designed to help make people aware of information culture in daily life and to more comprehensively promote informatization. For the past 22 years, leaders from government, industry, academic and citizens groups organize events that call attention to the nation’s progress in informatization. Awards are given to citizens who have made exemplary contributions in this area and there is naturally considerable media attention.\textsuperscript{366}

Korea’s informatization efforts proceeded in stages. They received a big boost with the establishment of the Ministry of Information and Communications and consolidation of its telecoms policy leadership in 1994 and the passage of the Informatization Promotion Basic Act in 1995.

From 2002-2004 special attention was paid to addressing the problem of digital divides, at both national and global levels. Both the “E-Korea Basic Plan” and the U-Korea Basic Plan” were established, indicating a move from internet-based informatization toward the ubiquitous society. In January 2003, pursuant to Article 16 of the Act on the Digital Divide, the Korea Information Culture Center was upgraded to become the Korea Agency for Digital Opportunity and Promotion (KADO).

Most recently, Korea’s drive to develop information culture has been promoted through the U-Korea Basic Strategy Plan, moving toward the new paradigm of a ubiquitous networked society. While previous campaigns had been computer oriented, these efforts were directed toward use of mobile phones and other wireless value-added devices.\textsuperscript{367}


The Informatization Promotion Fund

The goals of South Korea’s Information Promotion Fund (IPF) included not only rolling out broadband networks, but also promotion of E-government, support for ICT R&D, standardization, and ICT education.

The IPF, based on both government and private sector contributions, allowed profits from the ICT fields to be reallocated into the ICT sector. From 1993 to 2002 the IPF reached U.S. $7.78 billion. About 40 percent came from the government, 46 percent from private firms, and 14 percent from miscellaneous profits and interest receipts.

A total of U.S.$5.33 billion was invested between 1994 and 2003. Of that total, 38 percent was invested in ICT R&D, 20 percent into informatization promotion, 18 percent into ICT human resource development, 15.1 percent in broadband infrastructure and promotion, 7 percent in infrastructure in the ICT industries, and 3 percent in standardization. In other words, if one includes R&D, fully three quarters of the IPF was used for educational purposes.  

Korea’s Expanded Education Efforts in Developing Countries

In 1998, the KADO launched an invitational program to train overseas IT experts and corporate leaders. One broad aim of the program was to help strengthen Korea’s global IT leadership by working to narrow the digital divide among countries of the world. As of 2006, there were a total of 2,102 participants in the educational program from 99 countries. Also, beginning in 2002, KADO constructed a total of 10 information centers dealing with South Korea’s IT infrastructure in developing countries, building two every year. Finally, KADO dispatched youth service teams overseas to help promulgate the Internet. 1,650 young men and women with IT talent visited 57 countries from 2001 through 2006.

In 2007, the Information and Communications University introduced a program called the IBT Policy Program for Senior Officials (IPPSO). This program had the same basic goal as KADO’s efforts, to share Korea’s experience with communication and information technology in the convergence era. Since its inception the IPPSO program has trained over 100 senior officials from 47 different countries.

ICT Education

Part of South Korea’s immense educational effort over the years was directed toward technical training that would allow its citizens to use computers, the internet, and the myriad of other technical gadgets that come along with modern

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370 http://ippso.icu.ac.kr/m1/message.jsp?Menu_Id=message
digital networks. Without technicians to lay the fiber optic cable, or to install the routers, switches and mobile base stations, one can hardly conceive of Korea today. Or, to take another example, suppose one’s mobile phone malfunctions. Think of how important a role is played by the technicians at the after-service center who dismantle the phone to replace a broken cable or solder in a new electronic component.

In 1985, the Information and Communication Training Center implemented programs for those graduating with non-computer majors and trained 1,900 people that year in ICT skills. By 1995 a total of 32,000 people had completed such training programs. 371

The 1997-98 economic crisis, most widely known in Korea as the “IMF Crisis,” stimulated renewed attention to ICT training and did so on a massive scale. In 1999, on the heels of the crisis, the government announced a comprehensive informatization program aimed at improving the digital literacy of the entire Korean population. It was called, appropriately, “The Informatization Education Plan for 25 Million People,” and its name indicated its ambitious character.

The plan aimed different education strategies at different target groups. Initially, it focused on 10 million students, 0.9 million government officials, and 0.6 million of those serving in the military. This was later extended to include the disabled, housewives, the unemployed, farmers and fishermen. Broadcasting organizations were employed to educate people about IT communications with informatization education textbooks and an information communication terminology book also being published and distributed.

Under this plan Information Education Centers were established at post offices throughout the country to offer education services to the general public. IT Instructors were trained and supported through the Information Culture Center.

As if this were not enough, from 2000 through 2002 a separate basic information education plan was carried out side by side with the ongoing effort. This plan was aimed specifically at those who were socially disadvantaged and therefore had a lesser opportunity for education. Its aim was to minimize the digital divide within Korean society. By 2002 almost 11 million people, including housewives and farmers had received ICT education. The program increased internet use among the population, helped develop the IT industry and aided expansion of the information infrastructure. 372

The government’s support of ICT education was not limited to technical aspects of the new digital media. Recognizing that digital contents add value to the nation’s new digital networks, the government also undertook a range of efforts to support the development of new content. They included assistance to improve the education curriculum and increase the number of professors for digital

content-related departments in universities, and efforts to foster game developers. Government support for human resource development included measures to bolster education at home and abroad and to foster IT manpower that was actually demanded by industry.³⁷³

In summary, South Korea’s efforts at ICT education over the past three decades have accomplished two important goals. First, they ensured an adequate supply of technicians to install and maintain the constantly changing and ever more powerful digital networks and the electronic devices that connect to them. Second, they ensured that a very broad section of the nation’s citizens—approaching half of the population—could avail themselves of basic education about how to use a personal computer and the internet. Probably no other country in the world has gone to such expense and effort to educate the public in order that all citizens might fully participate in the information society.

**Innovation, Research and Development**

Daniel Bell noted back in 1973 that “The joining of science, technology and economics in recent years is symbolized by the phrase “research and development” (R&D).”³⁷⁴ Popular conceptions of R&D lead some people to think that it consists merely of scientists playing in their laboratories while using up large amounts of the government budget. Many think that scientists can squander hundreds of millions of dollars in citizen’s taxes while only using their heads. To the contrary, research and development, properly understood, is a money-making business.³⁷⁵

As shown in Chapter two, two major R&D projects were at the heart of the epochal developments of the 1980s in South Korea. Without successful research and the development of the TDX switching system and the 4 Mb Dram semiconductor, the telecommunications revolution of that decade might not have occurred. It was the success of those two R&D projects that ignited the information revolution in South Korea. One of their most important consequences was to instill an appreciation of the role of research and development among the nation’s leaders.

**The Structure of R&D in Korea**

Research and development activities in South Korea are conducted by private corporations, government research institutes, and universities. As shown in Figure 2.9, the large firms accounted for well over half of all basic research and development. As of 2006, 61 percent of all basic research and development in Korea was conducted by private corporations, with all but seven percent of that


³⁷⁵ Oh, Myung, Living Legend ms., p. 5
being done by large firms.\textsuperscript{376} Government research institutes accounted for 17 percent, and universities 22 percent of basic research and development. When compared with other countries in the world, Korea still has a relatively low percentage of R&D conducted in universities. As noted in a recent OECD report, government research institutes were traditionally used as the vehicle to accelerate technology adoption, while universities were concerned with teaching.\textsuperscript{377}

Business R&D expenditures in Korea are heavily focused on high technology, especially ICT, as shown in Figure 7.1.\textsuperscript{378}

\textbf{INSERT FIGURE 7.1 ABOUT HERE}


Figure 2.11. Composition of Korean BERD by industry, 2004

Taken together, electronic parts and audio/video communication equipment account for approximately half of all business R&D.

**Trends in Korean R&D**

Korea has one of the world’s highest levels of gross domestic expenditure on R&D (GERD). In 2006 it amounted to a little under USD 30 billion, or 3.23% of GDP. This was one of the highest levels in the world. Over the past several decades there have been several broad trends in R&D expenditure in South Korea.

First, as shown in Figure 7.2, South Korea has steadily increased its expenditure on research and development since the mid 1960s. This is represented by the line showing R&D as a percentage of GNP.

INSERT FIGURE 7.2 ABOUT HERE
Gross Expenditure on Research and Development in Korea, 1976–2008

Source: Ministry of Education, Science Technology (MEST)
Second, there is a clear trend, toward an increasing reliance on the private sector and a decreased reliance on the government for R&D funding. The annual growth rate of business R&D in Korea is about twice the OECD average and is among the highest in the world. This reflects the emergence of Korean leaders in industrial technology, especially in information and communication technology, automobiles, shipbuilding and steel.\(^\text{379}\)

Third, as Korea caught up with advanced countries and moved toward technological frontiers, it faced an increased need to conduct fundamental research. Accordingly, basic research increased from 13.6% of total spending in 1999 to 15.2% in 2006.\(^\text{380}\) In particular, within private sector R&D the proportion of basic to applied research has increased. In 1998 basic research accounted for only 6.5 percent of private sector R&D, a figure that had increased to 12% in 2004.\(^\text{381}\)

President Lee, Myung Bak’s government reorganization in 2008 shifted the government’s R&D budget, which had been under the control of the Ministry of Science and Technology, to the new Ministry of Education, Science and Technology. The new government also declared that it would increase the level of government investment in R&D while placing more emphasis on basic or fundamental, rather than applied research.

\[\text{INSERT FIGURE 7.3 ABOUT HERE}\]


To be labeled Figure 7.3.
As shown in Figure 7.3, R&D in South Korea’s ICT industries grew steadily over the years from 1991 through 2008. In 2008 it accounted for approximately 48 percent of total national research and development. In that same year, business enterprises accounted for about 89 percent of total national R&D expenditure. Clearly business, rather than government has contributed the major portion of research and development funding, but this is not to diminish the leadership impact of the smaller, but targeted, governmental expenditures.

**Intellectual Property and Innovation**

Patent statistics provide one reliable, although far from perfect, indicator of innovative activity. Not all inventions are patented and the internationalization of R&D means that research may be conducted in one location, but protection for the invention sought in another. Also, use of the patent system to protect inventions varies across countries and industries. Nevertheless, the number of patent applications in a country is one measure of its success in research and development. The granting of patents represents an important step in the “development” side of the R&D equation.

A 2009 report by the World Intellectual Property Organization noted that between 1995 and 2007 there was a significant increase in the number of patent filings received by the patent offices of China and the Republic of Korea. The five largest patent offices (China, European Patent Office, Japan, the Republic of Korea and the United States of America) accounted for 69% of total resident filings and 81.5% of non-resident filings in 2007. As shown in Figure 7.4, the Korea patent office ranked fourth in the world in total filings in 2007, after the United States, Japan and China.

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385 Source: WIPO Statistics Database.
Figure 4.6: Patent Applications by Leading Patent Offices, 1980-2008

Source: World Intellectual Property Organization
The World Intellectual Property Organization also presents data on the relative specialization index which shows the technologies in which different countries have above or below average concentrations of patent filings. South Korea has high and above-average concentrations of filings in telecommunications and semiconductors.\(^{386}\)

The World Intellectual Property Organization in 2009 reported that South Korea ranked number one in the world in Patent Filings per Gross Domestic product, a measure that corrects for the effects of country size.\(^{387}\) It also ranked number one in the world on another measure commonly used to correct for country size, Patent Filings per Research and Development (R&D) Expenditure.\(^{388}\) Japan ranked second and China was in the top five on both measures.

**Globalization of ICT Research and Development**

In recent years there has been a broad trend in ICT research and development toward more international and collaborative work. Many firms are embracing open innovation approaches and collaborating with external actors. Underlying these changes are the increasingly knowledge-driven nature of innovation and the changing organization of research and exchange of knowledge, driven by information technologies.\(^{389}\) A recent OECD report noted that an increasingly globalized ICT R&D agenda is emerging with the following eight broad priorities.

- Physical foundations of computing
- Computing systems and architectures
- Converging technologies and scientific disciplines
- Network infrastructures
- Software engineering and data management
- Digital content technologies
- Human technology interfaces
- ICT and internet security and safety\(^{390}\)


In 2005 the OECD sector including 21 ICT goods and services spent about two and a half times as much on R&D as the automotive sector and more than triple the pharmaceutical sector. Korean ICT firms have caught up to firms in other advanced OECD countries in terms of R&D spending.\textsuperscript{391} Notably, in 2007 Samsung Electronics overtook IBM in overall levels of R&D spending.

ICT-related R&D is increasingly important to technological advances and innovation in non-ICT sectors. These include space, defense, infrastructure (power grids), automobiles, automation, robots, logistics, aviation, health care, environment, monitoring and toys.\textsuperscript{392}

As of 2005, the Korea Industrial Technology Association reported that Korean firms had set up about 60 overseas research and development centers. Ten of these were operated by Samsung Electronics, and an even larger number by LG Electronics. Hyundai Motor operated five overseas R&D centers, three of which were in the United States.\textsuperscript{393}

**Daedok Innopolis and ETRI**

In 1973 the Korean government announced plans to build a science city in Taejon, a centrally located city that had traditionally been a hub for rail transportation and is today only 50 minutes from Seoul via the high speed KTX train. That development has today become the Daedok Innopolis. Located on and near the grounds of the Expo Science Park in Taejon, the Daedok Innopolis is now home to 242 organizations including 21 government-sponsored research institutes, 39 private research institutes and 148 ventures. Taejon is also the home of the Korea Advanced Institute of Science and Technology (KAIST) and several other universities as well as the Electronics and Telecommunications Research Institute (ETRI).

The goal of the Daedok Innopolis is to help realize a positive cycle in which R&D, commercialization and profits can interact. Among the notable commercialization successes coming out of Daedok Innopolis are CDMA, LCD modules, Wibro and DMB. To this date, the Innopolis has assisted over 900 venture firms.\textsuperscript{394}

The role of ETRI, which is located inside the Taedok Innopolis, deserves special emphasis. While the Ministry of Information and Communication was steadily


increasing its influence, the Electronics and Telecommunications Research Institute became the nation’s leading R&D center in the ICT field. In 2006 ETRI commissioned a retrospective study of its research and development activity. That study concluded that the total direct and indirect economic effects of ETRI’s research totaled over $104.5 billion. The same study applied Pareto’s law (the 80:20 rule) to ETRI’s situation and found that R&D investment in the following five core technologies, accounted for only 12.5 percent of total research investment but 80 percent of the economic impact.

- TDX
- DRAM
- CDMA
- DMB
- WiBro

ETRI has a set of ambitious goals. Its current management objectives call for it to become “the world’s best IT and R&D Institution of the 21st Century.

To measure its progress in maximizing intellectual capital, ETRI in 2003 began publishing an annual Intellectual Capital report. In doing so, it recognized the increasing importance of intangible assets in the information age. It was also a response to criticisms of Korean government-sponsored research institutes for a lack of visible performance measures, considering the large expenditures on R&D.

In 2004, Intel, the world’s largest maker of computer chips, signed an agreement to develop technologies with ETRI for products used in wireless technology and the home. The new research center was to hire 20 people and Intel hired K.S. Lee, formerly of Samsung Electronics, to head the center. ETRI has entered into a number of similar cooperative arrangements with companies and research institutes around the world.

In April of 2009, ETRI signed an MOU with Technische Universitat Darmstadt to help develop internet protocol television (IPTV) and next generation network technologies. The tie-up was proposed by the German university and would give ETRI a presence in Hessen, which is home to global IT software and

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395 Analysis of the Results of 30 years of ETRI Research and Development, July 2006, ETRI and Technovation Partners (Korean language report), p. 3-5.
telecommunications companies. From our vantage point, in 2009, ETRI has progressed well beyond its early goal of becoming a "Bell Labs" for Korea.

**KISDI: The Role of Telecommunications Policy Research**

On January 30, 1988 Korea formally opened the Korea Information Society Development Institute (KISDI), the world’s first institute to receive that name. It was created by renaming the Institute for Communication Research, which had been founded in 1985.

The founding of KISDI sent a powerful message to the nation and the world about the priority South Korea’s government placed on information society development. It was also a clear indication that the Korean government recognized several realities.

- The growing importance of government policies affecting telecommunications and the growth of a healthy information society.
- The increasingly global nature of telecommunications technology and policies, and
- The need for the best possible research into policy alternatives, from economic, political and other social science perspectives.

KISDI has addressed each of these concerns as it has grown in stature over more than two decades. Its research provides vital background information on policy alternatives and makes recommendations for consideration by Korean government officials and communications industry leaders. Over the years, members of KISDI’s research staff formed part of Korea’s team in bilateral trade negotiations with the U.S. and in the WTO negotiations. By providing research-based inputs into the policy process, KISDI today contributes to digital development not only in Korea, but around the world.

**Globalization of Education in Korea**

The information revolution itself is a major factor contributing to the globalization of education, and Korean education has been profoundly affected by these developments. In the following pages we review some general developments in study abroad by Korean students, Korea’s efforts to attract international students, and the globalization of research and development.

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399 In its early years, when it was still part of AT&T, Bell Labs developed telephone switching devices. Now the research organization of Alcatel-Lucent, Bell Labs was where the transistor was invented and over the years many of its researchers had won the Nobel Prize.

400 On November 28, 1987 The Korea Information Society Development Institute Act (No. 3,952) was proclaimed. On December 31, 1987 the Enforcement Decree of the Korea Information Society Development Institute Act (Presidential Decree No. 12,360) was proclaimed.
Study Abroad as a Factor in Korea’s Information Revolution

The Korean diaspora dates from the Japanese colonial period. Few people from Korea had left the country before 1910. However, during the colonial period a sizeable number of workers left their homeland and settled in Manchuria, on Sakhalin and in Japan. Most of these emigrants were indentured labor migrants, but some were forced to leave their home country under colonial rule. During the same period of time, many Koreans migrated to China and stayed there because of dissatisfaction with Japanese colonization of their homeland.\footnote{C. Fred Bergsten and Choi, Inbom eds. \textit{Korean Diaspora in the Making: Its Current Status and Impact on the Korean Economy}, Special Report 15, Washington: Peterson Institute for International Economics, 2003, p. 15.}

The character of Korean migration changed decisively in the 1960s, when the country’s economy began to develop and the government adopted an active emigration policy as a part of population control. Many Koreans moved to other countries in search of better economic opportunities, with the majority going to the United States. By 2003 there were fifteen countries with more than 10,000 Koreans and five countries with more than 100,000. These latter five include the United States, China, Japan, the CIS and Canada which together account for about 93 percent of overseas Koreans. Overseas Korean residents totaled 6.64 million in 175 different countries around the world, including 1.15 million temporary Korean expatriates.\footnote{C. Fred Bergsten and Choi, Inbom eds. \textit{Korean Diaspora in the Making: Its Current Status and Impact on the Korean Economy}, Special Report 15, Washington: Peterson Institute for International Economics, 2003, p. 16–17.}

Academic studies have shown repeatedly that trade and investment bear an important relationship to diasporas. Our study adds support to that notion by showing the role of Korean engineers and academics in the U.S. in both the successful TDX electronic switching project and in jump-starting the semiconductor industry in South Korea. The business and social networks created by diasporas help to overcome informal trade barriers.\footnote{C. Fred Bergsten and Choi, Inbom eds. \textit{Korean Diaspora in the Making: Its Current Status and Impact on the Korean Economy}, Special Report 15, Washington: Peterson Institute for International Economics, 2003, p. 19.}

During the early decades of South Korea’s post-war development, while it was building its own system of university education, it began sending large numbers of students overseas to study. Their most popular destination, by far, was the United States. There are several aspects to this remarkable phenomenon.

First, the system of tertiary education in South Korea is broadly based on the American model. The academic calendar, courses offered, administration, activities and overall structure of admissions, grading and so forth all resemble colleges and universities in the United States.

Second, the popularity of study in the United States meant that Koreans who had earned Ph.D.s in the U.S. came to occupy positions of leadership in government,
industry and academia. Today, three quarters or more of the professorships in leading South Korean universities are held by U.S.-trained Ph.D.s.

Third, study in the U.S. became so popular that South Korea became the number one source of international students for U.S. colleges and universities. As of December 2008, over 110,000 Korean students were studying in the U.S., at all levels. This number exceeded the totals from Korea’s more populous Asian neighbors China, India and Japan. In short, South Korea has forged by far the largest study-abroad relationship with the United States of any country in the world.404

Finally, it is important to underscore that study abroad is first and foremost a cultural experience. Those who went to the United States in the 1970s or even earlier, not only went from an East Asian to a Western culture, but from one of the poorest countries in the world to the world’s richest country. This helps to explain the big impact the experience had on them. The cultural experience more than anything else was important.405

To be more specific, those who studied in technical fields like electrical engineering or other sciences that relate to ICT development, not only learned the subject matter being taught at their university, but had a chance to observe and participate in the American way of life. Such experiences ranged from using the telephone system in the U.S., with its collect calls, different style pay phones, and other services that were not available in Korea at that time. For some of them, the contrast between relatively universal and reliable telephone service in the U.S. and the utter lack of such service in Korea, imbued a strong determination to do something about it when they finished their study and returned to Korea.

Research by Choi showed that the Korean diaspora appeared to have a positive impact on trade by generating more exports than imports. He estimated that a doubling of the number of overseas Koreans appeared to increase South Korea’s exports by 16 percent while increasing its imports by 14 percent. Significantly, his research underscored that the diaspora did not cause a brain drain, but instead contributed to South Korea’s development by transferring back home the knowledge and skills gained in more advanced countries.406

The globalization of education in Korea is a fitting topic with which to conclude this chapter. The new media, epitomized by the internet, are so inherently global in their scope and ramifications, that these developments must be at the heart of


405 Dr. Oh, Myung was one of these.

any attempt to understand Korea’s emerging information society. Ultimately, success in building such a society will depend heavily on education, for citizen awareness, research and development, and even Korean reunification.
Chapter 8: Korea’s Information Culture and Media Ecology

“Communication is the fundamental social process.”407

Within the global network formed by broadband internet, languages and cultures like Korea’s seem to thrive. Hallyu, or the Korean Wave, provides one example and Naver, the preferred Korean-language search engine another. Cultures, like societies, are human constructions. As the information revolution progresses, culture both influences the shape of a nation’s media environment and is itself transformed by the new information and communication technologies. This chapter examines the interaction between this two-way give and take between culture and technology in South Korea, along with the quality and texture of its information culture.

We first examine the new digital media ecology that has emerged in South Korea over the past several decades. The second section looks at salient aspects of Korea’s information culture, including the role of language, media institutions, consumer culture and political culture. The third part of the chapter takes up the dark side of the information society, including such topics as internet addiction, personal identity theft, hacking and cyber-bullying. Finally, the chapter concludes with a look at the warm and emotional way in which information technology was presented in the Ubiquitous Dream Hall and more generally in Korean media content.

The New Media Ecology

In Korea, as in other countries, convergence of media and technology changes the way we learn about the world. It is no longer sufficient simply to read the printed word. Children and adults must be able to critically interpret the powerful images of a multimedia world. As the media become more pervasive, some have suggested that they not only shape culture, but in fact they are culture.408

In this new information culture, the concept of media ecology, broadly defined as the study of complex communication systems as environments becomes more useful to describe the evolution of an information society.409 Korea’s new media ecology has several key features.

First, there is a steady but measurable increase in use of the internet versus other media. Media convergence itself complicates measurement of the new media environment. Channels or “apps” on the internet continue to proliferate,


along with digital displays and user devices, forming a richer and denser information environment.

A second feature of Korea’s new media ecology is the continued centrality of television. Whether it is called television or internet, the televised or video portion of news, information and entertainment programming continues to hold great appeal for Korean audiences, as we will discuss below. Eli Noam captured the essence of this logic in a pithy 2008 editorial in *The Financial Times*, entitled “TV or Not TV.” As he points out, television used to be simple, with a few broadcast channels, all government licensed and tightly controlled. Then cable systems and satellites were integrated into the system, adding greatly to the number of channels. Now, we are entering the next stage, where television programs are delivered over the internet and wireless networks, to computers, mobile phones and other devices.

A third important aspect of the new media ecology in Korea is that, on balance, it promotes positive notions of information culture. For example, much of current advertising for electronic communication devices promoted a positive view of how human beings could use the technology. A good example was the “Sarang-hayeo, Sarang-hayeo LG” (literally “I love you, I love you LG”) musical and artistic promotional campaign televised by LG Electronics in 2009 to promote its household appliances and electronics products.

Yet a fourth aspect of South Korea’s media ecology is that many parts of are more interactive and involving. Whether in the subway, on the street, at home, at school or at work, it seems that a good portion of South Koreans are immersed in electronic communication.

**Seoul’s Screens**

The Seoul metropolitan area, which sprawls out in all directions into Kyonggi province is home to nearly half the South Korean population. Among its many unique features, Seoul today is a city with a profusion of digital screens.

Well into the 1970s electric billboards and lighted signs were prohibited by law, as was color television. The digital revolution of the 1980s changed all of that, spurring growth in the graphics industry and allowing Korea’s venerable alphabet, *Hangul*, to start appearing on signboards in a never-ending array of creative new fonts.

Today, Seoul is a city filled with bright and colorful digital screens that range in size from the façade of an entire building to the screens on mobile phones that everyone carries. There are small TV screens in subways, in elevators and on the navigation devices that virtually every taxi uses. As part of Seoul’s effort to become a design capital it hosted a “2009 Seoul Festival of Light.” In November as part of that festival the largest LED screen in the world was lit for the first time on the façade of the former Daewoo Building, opposite Seoul Station. The

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screen was 99 meters wide and 78 meters high, and consisted of 42,000 LEDs covering the face of the 19 story building. Its initial display included “Walking People,” a work by the renowned British pop artist, Julian Opie.\textsuperscript{411}

Seoul is also a city of bangs, all sorts of which prominently feature electronic screens. As Choi notes, these include PC Bangs, norae-bang (Karaoke) and DVD-bang, as well as the jimjil-bang. Culturally speaking, Koreans think of a bang as a multifunctional space, whose purpose changes according to the occupant’s will. Thus, jimjil bangs contain sauna like rooms, baths, sleeping rooms, snack bars and a PC room.

\textbf{The PC Bang Phenomenon}

PC rooms played an important role in the rapid diffusion of broadband internet in Korea, especially before many Koreans had high speed internet access at home or at their office. As shown in Figure 8.1, the number of internet cafes in the country increased more than five times from 1998 to 1999 and then showed a 42 percent increase year-on-year in 2000. This rapid growth took place in the immediate wake of the Asian Financial crisis and when Hannaro was beginning to offer broadband services via DSL connections. In addition, Starcraft was introduced to the online game market in 1998, boosting demand for high speed broadband as opposed to slower dial-up connections to the internet.\textsuperscript{412} There was also a reciprocal influence in that the introduction of low, flat-rate ISP pricing for broadband internet contributed greatly to the popularity of Starcraft and other online games. Multiplayer online games require speed in order to give a realistic sensation of simultaneous interaction online with many other players.

FIGURE 8.1 ABOUT HERE


Figure 8.1 Number of Internet Cafes in Korea (1998-2005)
The number of internet cafes peaked in 2001 at 22,548 and has since maintained approximately that level, for two main reasons. First, high speed internet had become nearly universally available, at home or at work. Second, the internet cafes had reached a saturation level where they were present in literally every neighborhood throughout Korea.

**Massive Multiplayer Online Games**

In addition to their role in creating demand for the fastest possible broadband internet service in South Korea, the emergence of PC Bangs also created a unique social space for gamers. In recent years, South Korea has become well known as a center in the growing international market for massive multiplayer online games (MMOG).

Viewing game exports as a future growth engine, the government’s eventual goal was to make Korea the number three ranking country in the world in the game industry, following the United States and Japan. In December of 2008, the Korean government announced that it would invest $242.2 million in the game industry through 2012 in an effort to raise annual exports to about $3.5 billion.

The nation pushed game exports to Japan, China, the United States and other countries. Within South Korea itself, online gaming was a growing and important part of culture, increasingly accepted by the mainstream. As of 2009 there were three cable television channels devoted to internet games. It had become a professional sport in which those who did well were considered national heroes. South Korea even established a Game Science High School in 2004. Students who were accepted into the school completed all of their national requirements for high school graduation the first year and then worked on industry-related projects for the remaining three years of high school.

**Size and Growth of the Game Market**

As of 2005, console games for products such as Sony’s PlayStation 3, Microsoft’s Xbox and Nintendo’s Wii made up 60-70 percent of the market in the U.S. and Europe. By contrast, they attracted only 11.5% of the market in South Korea, while online games accounted for three quarters of it. The number of game companies in Korea increased from 694 in 1999 to nearly 3,000 in 2005. As of 2008, more than 25 million people in Korea play online games, amounting to 54 percent of the country’s population.

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In retrospect, it is clear that several factors heavily influenced the rise of Korea’s game industry. First, development of the game industry coincided historically with the spread of high speed broadband internet. The industry showed little development before 1999, which was the same time that broadband usage began to take off.\footnote{2007 The Rise of Korean Games: Guide to Korean Game Industry and Culture. Ministry of Culture and Tourism. Korea Game Industry Agency, p. 6.}

A second related factor in the rise of Korea’s game industry was continued investment by the government. Responsibility changed from the Ministry of Health and Welfare to the Ministry of Culture and Tourism and cooperation was enlisted from the Ministry of Commerce and the Ministry of Information and Communication to provide supportive policies for the game industry beginning in August 1998.

A third factor was the increase in overseas ventures by the game industry, which commenced after the turn of the century and began bearing fruit in 2005. In 2006 the international growth continued and a variety of genre games emerged. They included MMORPG (Massive Multi-player Online Role Playing Games), first person shooting games (FPS) and racing games, represented by Kart Rider. The expansion of game genres contributed to more diversity among users of games, expanding to the 30s and 40s demographics and including more women.\footnote{2007 The Rise of Korean Games: Guide to Korean Game Industry and Culture. Ministry of Culture and Tourism. Korea Game Industry Agency, p. 12.}

Finally, as the rapid popularization of online games and their acceptance into mainstream Korean culture shows, they also met important cultural needs. Korean youth have used online games, along with instant messaging and blogging, to nurture friendships and to help create their own tightly knit communities.\footnote{Jin, Dal Yong and Florence Chee “Age of New Media Empires: A Critical Interpretation of the Korean Online Game Industry” Volume 3, Number 1, January 2008, 38-58 Sage Publications http://gac.sagepub.com}

**Regulating Gambling**

In December of 2006 the nation was caught by surprise when prosecutors indicted two businessmen who produced and distributed “Sea Story” video slot machines.\footnote{“Foreign Based Korean Gambling Websites Sprout” Korea Times May 10, 2007. www.koreatimes.co.kr} This led to a sharp rise in public interest and scrutiny of game industry policies. In January of 2007, the Game Industry Promotion Act of 2006 was amended to provide legal authority for a wide range of policies used to regulate development of the game industry.\footnote{2007 The Rise of Korean Games: Guide to Korean Game Industry and Culture. Ministry of Culture and Tourism. Korea Game Industry Agency, p. 6.} The amended law gave the
Korean government sweeping authority to control all of the various aspects of the game industry, including industry developments, planning, operations, training, research and development, and the revitalization of e-sports, to name a few areas.

In March of 2007 the Korea Internet Safety Commission asked the country’s Internet service providers to block access to 549 foreign-based Korean-language gambling sites. According to an official at the government Commission, these sites began to spring up en masse in late 2006, when the offline “sea story” scandal erupted.421

Legally, under South Korea’s system for rating and approval of online and mobile games, the main reason for deferral or rejection of approval for a game has to do with how online money is handled in gambling-like games. These included such popular games as GoStop, Matgo and Seven Poker. There are strict rules controlling how a user could re-charge an account with game money for those games in order not to “stir up excessive gambling spirits.” If it could be demonstrated that a game could be recharged with cash, it would be rejected by the Game Rating Board. Despite these measures, “illegal trades with cash and game items on gambling game websites were reported to be on the increase in 2007.422

Online Games in Korean Culture

Chee’s investigations of online games in the Korean cultural milieu suggest that the elevated level of gaming in Korea is not due to the game itself, but rather the cultural, geographical and economic context in Korea. Her research was based on participant observation, focus groups and interviews with gamers in South Korea. She found that PC Bangs functioned as “third places” or places of psychological comfort and support for young people in Korea. “At a third place, such as a PC bang, one can choose from online games, e-mail, online chat, Web surfing, visiting matchmaking sites, people watching, eating, smoking being with big groups of friends or just being with one’s significant other in a friendlier setting.”423 Some of her respondents were students who used PC Bangs as a warm and cheap place to meet during the cold Korean winters.

A number of the people Chee interviewed mentioned the concept of wang-tta in which refusal to partake in game play could subject one to isolation and ridicule. The fear of such isolation caused many young people to practice the games of their peer groups in order to become more skilled and less subject to such ridicule. A "wang-tta effect" frequently took place when an online game player

was forced to remove himself from the community of players due to circumstances beyond the individual’s control, such as military service. Upon return to the group after military service or study abroad, the individual’s game skills had typically dropped significantly. Chee concluded that the Korean social phenomenon of Wang-tta, or singling out one person in a group to bully or treat as an outcast helps to explain the motivations to excel at digital games and is one of the strong drivers of community membership.

Features of Korea’s Information Culture

Generally speaking, Korean culture is oriented toward relationships and toward the group. Korea’s longstanding cultural heritage places a premium on use of interpersonal communication networks and knowing one’s proper place in them. This cultural characteristic helps to explain why Koreans have been early adopters of new digital media including mobile phones and the internet. They are acculturated to communicate frequently with members of their family, school, work or other social groups. The new digital media, which operate more like augmented interpersonal networks than the old mass media, simply provide additional channels for them to carry on this communication.

While Koreans have been quick to adopt the new digital media, it would be a mistake to think that Koreans have therefore adopted some sort of global or universal culture. To the contrary, as a review of some prominent features of Korean information culture shows, the information society being built in South Korea is distinctively Korean.

Trust in Media

The question of trust is a fundamental component of human communication and gets close to the heart of important questions about the media culture of any nation. Survey data from around the world suggest that younger generations, who grow up using the internet, are more likely to trust it as a source of news and information about the world around them. A ten-country survey in 2006 for the BBC, Reuters and the Media Center showed that more people trust in the media than in their governments, especially in developing countries. Not surprisingly, national television was the most trusted news source overall, trusted by 82 percent of the respondents. Across all ten countries, television was also seen as the most important news source, by 56 percent of the respondents, followed by 21 percent who cited newspapers and only 9 percent who mentioned the internet.

However, the pattern in South Korea was different. 76 percent expressed their highest levels of trust in television, while 64 percent mentioned national and regional newspapers. However, 55 percent also mentioned news websites. Asked which specific news source they consider most trustworthy, South Koreans’ responses include KBS television (mentioned by 18%), the website NAVER (13%), Chosun (10%), MBC television (9%), DongA and ChoongAng (both 6%), DAUM website (5%), Hankyoreh (3%), South Korea’s National TV Station and YTN television (both 3%), and Yahoo and the Economist (both 1%). South Korea was the only country where websites were so trusted to provide for individuals’ news consumption.427

In 2007, the Edelman Trust Barometer, a survey of opinion leaders in 18 countries, found that Korea led the world in trusting the internet and blogs in sharing credible information.428 In 2009, trust in social networks almost doubled from the previous year rising from 24% to 45%. Globally Edelman found that technology was the most trusted sector, with 76 percent of respondents saying they trusted it in 2009. In the same year, 81 percent of respondents indicated that they trusted the technology sector. This is in keeping with the generally positive portrayal of ICT in most Korean media.429

Ohmynews: Web-based Citizen’s Journalism

The generally high levels of trust in new digital media in Korea is well illustrated by the success of Ohmynews, a pioneering effort at citizens journalism. The motto of Ohmynews is “Every Citizen’s a Reporter” (with some editing), and it combines characteristics of blogging with those of traditional journalism.

The Ohmynews project was started in 2000 by Oh Yeon Ho, a veteran journalist of Korea’s alternative media who was dissatisfied with the limitations of Korea’s predominantly conservative traditional media. The news site began with 727 citizen reporters and four editors. Five years later, Ohmynews had 38,000 citizen reporters. A dozen or more editors review submitted articles, fact check and correct typographical errors.430

Ohmynews has an eight point code of ethics as follows:

1. The citizen reporter must work in the spirit that “all citizens are reporters,” and plainly identify himself as a citizen reporter while covering stories.

2. The citizen reporter does not spread false information. He does not write articles based on groundless assumptions or predictions.


430 Kolodzy, Janet, Convergence Journalism: Writing and reporting across the news media, Lanham Maryland: Rowman and Littlefield, 2006, p. 231
3. The citizen reporter does not use abusive, vulgar, or otherwise offensive language constituting a personal attack.

4. The citizen reporter does not damage the reputation of others by composing articles that infringe on personal privacy.

5. The citizen reporter uses legitimate methods to gather information, and clearly informs his sources of the intention to cover a story.

6. The citizen reporter does not use his position for unjust gain, or otherwise seek personal profit.

7. The citizen reporter does not exaggerate or distort facts on behalf of himself or any organization to which he belongs.

8. The citizen reporter apologizes fully and promptly for coverage that is wrong or otherwise inappropriate.\(^{431}\)

As of this writing, Ohmynews has an international English Edition and also a television operation called OhmyTV.

**How Language Shapes Media Use**

Language as a key element of culture exerts a strong influence on how the internet and other media are used. In this regard, the ITU’s *Broadband Korea* case study contains an important insight.

“Korea is an exception to the argument that limited English fluency or non-Latin character alphabets are barriers to Internet access. The development of Korean content has been astounding and today the nation has one of the highest usage ratios of home grown content. The top 10 web sites accessed by Korean users are all in Korean. The number of domains registered using .KR—almost exclusively in the Korean language—ranks the nation fifth in the world. Not only has this driven use, but it has also reduced the need for expensive international circuits. It also suggests that in many ways the Internet in Korea is actually one big Intranet with most users preferring to access local sites.”\(^{432}\)

Although there is widespread enthusiasm in Korea for learning English, when it comes to use of the internet, Koreans display a strong preference for Korean. It wasn’t sufficient only to build the information superhighways in Korea. Korean language content was needed to attract the bulk of users. As the number of .kr domains began to sharply increase, so did internet usage.

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431 \[http://english.ohmynews.com/reporter_room/qa_board/qaboard_list.asp?page=1\&board=freeboard\]
432 Broadband Korea: Internet Case Study, ITU, March 2003, p. 11.
Korean netizens strong preference for Korean language web content largely explains why Naver, rather than Google, dominates the search market here. Remarkably given its world-leading digital networks, South Korea is one of only four national markets in the world today where Google’s internet search does not have a strong share of the market. The others in what the Financial Times termed the “non-Google World,” are China, Russia and the Czech Republic. In each of those countries, local companies designed technology to work in the local language.

A second reason for the tremendous popularity of Naver in South Korea is that it caters to the homogenous and group-oriented culture. Its most popular feature is called “Knowledge-in.” Using this feature, a user can submit a question and instantly receive a reply from the database that benefits from the collective intelligence of millions of other Korean users. It does an outstanding job of telling a Korean user what other Koreans are thinking on any given topic.

One harsh critique of the impact of broadband in Korea suggested that it has actually narrowed the Korean mindset. In this view the internet, instead of opening up Korea and Koreans, has made them more tribal and less global than before the internet. Huer argues that the protective anonymity of the internet has given Korean netizens a perfect sanctum from which to fire their fury and vengefulness that have long been denied.

Finally, it is worth noting that many Korean web surfers became comfortable with Naver before Google entered the Korean market or they became aware of it on their own. Korea’s lead over the U.S. and other nations in building high-speed broadband networks was instrumental in creating this situation. Also, the success of Naver in the South Korean internet market places an exclamation point under the crucial role of language and culture in shaping media use.

**Major Patterns in Internet Usage**

Survey data help to show how digital development in South Korea affects the daily life of its people. An annual survey in September of 2009 showed that there were 36.6 million internet users in South Korea, 77.2 percent of the population over age 3 and 77.6 percent of the population over age six. By comparison, in the year 2000, only 44.7 percent of the population over age 6 were internet users. Korea’s usage rate placed it ahead of Japan, the U.S. and many other OECD member nations, but behind some of the Scandinavian countries.

INSERT FIGURE 8.2 ABOUT HERE

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Although the data include all those who used the internet once a month or more, more than three quarters of those surveyed reported using the internet once a day or more. As of 2009, Korea’s internet users spent an average of 13.9 hours per week on the internet. However, about half of those surveyed reported using the internet more than fourteen hours per week and nearly one quarter of them more than 21 hours a week. How did they allocate this time?

Figure 8.3 shows the most common reasons for using the internet, according to the same national survey.

INSERT FIGURE 8.3 ABOUT HERE

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Table 8.1 shows how patterns of online media usage breaks down across age groups and for different types of media uses, based on a November 2008 survey of internet users ages 6 and older.

INSERT TABLE 8.1 ABOUT HERE
Table 8.1 Online Media Usage Rate by Type—Internet Users ages 6 and over

KCC-KISA, Survey on the internet Usage, November 2009

<table>
<thead>
<tr>
<th>Type</th>
<th>Online TV watching</th>
<th>Online newspaper reading</th>
<th>Online radio listening</th>
<th>Online movie watching</th>
<th>Online magazine book reading</th>
<th>Internet media usage rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>39.6</td>
<td>51.6</td>
<td>31.1</td>
<td>46.2</td>
<td>40.8</td>
<td>76.4</td>
</tr>
<tr>
<td>Male</td>
<td>40.8</td>
<td>57.4</td>
<td>30.4</td>
<td>48.6</td>
<td>40.0</td>
<td>77.8</td>
</tr>
<tr>
<td>Female</td>
<td>38.3</td>
<td>45.0</td>
<td>32.0</td>
<td>43.5</td>
<td>41.9</td>
<td>74.8</td>
</tr>
<tr>
<td>6~19</td>
<td>39.7</td>
<td>26.7</td>
<td>26.2</td>
<td>44.0</td>
<td>38.9</td>
<td>59.5</td>
</tr>
<tr>
<td>20s</td>
<td>64.6</td>
<td>69.5</td>
<td>46.4</td>
<td>76.8</td>
<td>65.0</td>
<td>96.8</td>
</tr>
<tr>
<td>30s</td>
<td>41.5</td>
<td>63.0</td>
<td>34.0</td>
<td>53.1</td>
<td>45.8</td>
<td>88.8</td>
</tr>
<tr>
<td>40s</td>
<td>29.0</td>
<td>56.1</td>
<td>26.5</td>
<td>32.7</td>
<td>28.7</td>
<td>74.8</td>
</tr>
<tr>
<td>50s</td>
<td>16.8</td>
<td>50.7</td>
<td>21.3</td>
<td>17.2</td>
<td>21.5</td>
<td>63.8</td>
</tr>
<tr>
<td>60 and Over</td>
<td>12.0</td>
<td>34.4</td>
<td>15.5</td>
<td>6.8</td>
<td>11.9</td>
<td>48.0</td>
</tr>
</tbody>
</table>
The data in the above table show a rather clearly delineated digital divide along generational lines. To see this at a glance, just look at the last row which shows online media use by those 60 and over, and compare it with the row for those in their “20s.” The differences in online media usage rates are striking. Overall, as shown in the last column, the rate is 97.1 percent for those in their 20’s compared with less than 60 percent for those 60 and over.

The data presented above show that Korea has a large volume of e-commerce and that citizens also use the internet for e-government. We turn next to a more detailed examination of those topics.

**E-Commerce and Korea’s Consumer Culture**

South Korea’s consumer culture started changing with completion of the nationwide, digitally switched PSTN in 1987, the start of a credit card verification service called EasyCheck (now the Korea Information and Communications Company, Ltd.) and the arrival of credit cards. But it has come a long, long way over the years. Koreans now have more credit and debit cards per person than any country in the world, with the exception of the United States, according to Bank of Korea data.

**Credit Card Usage**

In late March of 2002, police arrested four South Korean college students, charging them with an attempted bank robbery in Seoul using automatic rifles stolen from an army base. The students needed the money to pay off $11,300 in debts they had run up buying a car, brand-name clothes, and luxury goods for their girlfriends.

This incident sparked public debate, but not about the robbery or Korean youth. Rather it focused on the surge in irresponsible credit card use in South Korea. Between 1998 and 2002 the value of credit card transactions in South Korea rose almost seven times from $48 billion to $333 billion. In 2002 interest rates were at a very low level. Also, 60 percent of the Korean credit card volume at that point in time was from cash advances, suggesting that some consumers were getting money from one card to pay off another.

Starting in the late 1990s, the South Korean government had actively encouraged the use of credit cards as a payment method as a way of preventing

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437 [https://www.kicc.co.kr/eng/company_history.jsp](https://www.kicc.co.kr/eng/company_history.jsp)


tax evasion by merchants. Individual cardholders were entitled to tax deductions for expenditure paid by cards when filing a tax return.  

In 2003 the nation’s credit card bubble burst and the government was forced to intervene in the overleveraged credit card industry. The government measures called for companies and banks to put more cash into their credit card operations to cover bad debt and at the same time to enforce more stringent requirements for the issuance of credit cards.  

In the Spring of 2003, South Korea’s biggest companies and banks began pouring about $4 billion into their credit card companies as part of a government-driven plan to rescue them from bankruptcy and stave off another economic crisis. For example, Samsung Electronics led the offensive, pledging to invest another $100 million in the Samsung Card Company by the end of June. Other major companies followed.  

The Electronic Wallet: Mobile Phones as Money  
The concept of the electronic wallet has already made significant inroads into South Korea’s consumer culture. Korea’s mobile operators offer a service called the “Cellular Small Payment Service.” It allows subscribers to pay for online goods using authorization codes sent by SMS. This service is particular popular with younger Koreans, who can add such costs to their mobile telephone bills without needing a credit card.  

As of 2006, some 23 million Koreans or nearly half the population were using one of five competing cell-phone systems to make payments ranging from a few cents to $120. In 2006, Koreans were expected to charge nearly $1 billion using such services, up from just $290 million in 2002.  

The mobile operators also had other payment options, the best known of which was SK Telecom’s Moneta service. If the user had a phone model equipped with a Moneta smart card, linked to a credit card account, it was possible to make phone payments at hundreds of thousands of businesses that had installed dongles to communicate with the smart cards. In 2005, the Moneta service was expanded to allow its use in paying for goods purchased over the internet.  

More generally, the growth of commercial activities on the internet accompanied by increased online advertising provide two valuable indicators of South Korea’s changing media environment. As Table 8.2 shows, online shopping, advertising,

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games, banking and e-learning have all increased dramatically in the early years of the new century.

INSERT TABLE 8.2 ABOUT HERE
Table 8.2 below

<table>
<thead>
<tr>
<th>Type</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Shopping</td>
<td>70,548</td>
<td>77,881</td>
<td>136,756</td>
<td>134,600</td>
<td>157,656</td>
<td>181,455</td>
</tr>
<tr>
<td>Online Advertisement</td>
<td>3,559</td>
<td>4,832</td>
<td>6,625</td>
<td>8,907</td>
<td>12,068</td>
<td>13,225</td>
</tr>
<tr>
<td>Online Game</td>
<td>7,514</td>
<td>10,186</td>
<td>14,397</td>
<td>17,768</td>
<td>22,403</td>
<td>-</td>
</tr>
<tr>
<td>Online Banking (daily avg. fund transfer)</td>
<td>77,905</td>
<td>85,510</td>
<td>125,182</td>
<td>150,903</td>
<td>185,570</td>
<td>226,425</td>
</tr>
<tr>
<td>e-Learning</td>
<td>-</td>
<td>12,926</td>
<td>14,825</td>
<td>16,133</td>
<td>17,276</td>
<td>18,668</td>
</tr>
</tbody>
</table>

KOSTAT, 2008 Annual and Q4 e-Commerce and Online Shopping Trend, February 2009
IMCK, 2008 Internet Marketing Trend and Hot Issues, December 2008
KOCCA, 2008 Korea Game White Paper, August 2009
BOK, 2008 Online Banking Usage Statistics (Compiled), February 2009
In the year 2000, online advertising accounted for only 2.3 percent of all advertising expenditure in South Korea. By 2008 that had increased to 17 percent.\textsuperscript{444} Furthermore, many of the top advertisers in Korea represent the ICT sector. In 2006, for example, the top five broadcast advertisers were Samsung Electronics, SK Telecom, LG Electronics, KTF and KT in that order. By broadcast, we refer to traditional television, IPTV and DMB (digital multimedia broadcasting).\textsuperscript{445}

Nearly everyone in South Korea uses internet banking. In addition to the convenience factor for checking bank accounts and conducting transactions, the purchase of an apartment in Korea often carries with it a requirement to use internet banking. In 2002 there were 17.7 million registered internet banking users in Korea, a number that grew annually at double-digit rates and had reached 52.6 million by December of 2008.\textsuperscript{446}

Since 2004, over half of all stock trading in South Korea has been done online.\textsuperscript{447} The total volume of e-commerce transactions in 2008 was KRW 630 trillion, an increase of KRW 113 trillion from the previous year. In particular, the e-commerce transactions in Internet shopping malls were mostly carried out in ‘open markets’ such as Auction and G Market. The ‘open markets’ in Korea have experienced dramatic growth over the past 10 year period.\textsuperscript{448} A 2009 survey showed that 62.3\% of internet users age twelve and above in Korea are “Internet shopping service users,” who had purchased products online within the past year. Of these, more than 23 percent had made purchases within the past month. 70.3\% of females used internet shopping malls, compared with only 55.6\% of males. The highest usage rate was among those in their 20s at 88.6 percent.\textsuperscript{449}

\textbf{Social and Cultural Aspects of the Mobile Revolution}

In his “small world experiments” American psychologist Stanley Milgram gave subjects in several American cities a letter containing the names of certain individuals in another distant American city. They were to attempt to forward the letters to these individuals, but could do so only by sending the letter to someone

\textsuperscript{444} \textit{2009 Korea Internet White Paper}, Korea Communications Commission and the Korea Internet and Security Agency, July 2009, p. 63.

\textsuperscript{445} Chart is from KOBACO, \textit{Introduction to Broadcast Advertising in Korea} 2006, p. 44. \url{http://www.kobaco.co.kr/eng/cyberpr/image/english_2006.pdf}

\textsuperscript{446} \textit{2009 Korea Internet White Paper}, Korea Communications Commission and the Korea Internet and Security Agency, July 2009, p. 42.


\textsuperscript{448} \textit{2009 Korea Internet White Paper}, Korea Communications Commission and the Korea Internet and Security Agency, July 2009, p. 7.

\textsuperscript{449} \textit{2009 Korea Internet White Paper}, Korea Communications Commission and the Korea Internet and Security Agency, July 2009, p. 23.
they personally knew (defined as on a first-name basis). Of those letters that actually did reach the target, the average interpersonal network path length turned out to be about 5.5 or 6. Several researchers have conducted “small world” experiments with instant messaging and e-mail, getting results that support the “six degrees of separation” concept.450

South Korea experienced the power and speed of communication among interpersonal networks using mobile phones in the spring of 2008. That episode arose seemingly overnight as middle and high school age students and in some cases their parents communicated via text messaging or voice and social networking portals on the internet. There seems little doubt that the viral spread of information and misinformation contributed to the size and strength of made cow disease fears and the anti-U.S. beef candlelight vigils.

In the late Spring of 2008, citizen reporters using web cameras, notebooks and wireless broadband (WiBro) internet connections broadcast video reports of the anti-U.S. beef import candlelight vigils near City Hall.

INSERT FIGURE 8.4 ABOUT HERE

The strong group orientation of Korean culture engenders the need to keep up with others in one’s reference group and helps explain the speedy adoption of mobile communication here. The strong cultural tendency toward keeping up with brothers, sisters, cousins, or close friends helps to explain why Korean consumers, on average, change to a new model mobile phone once every 11 months.

Kim conducted an observational and survey study of mobile phone use, in which he focused on the changing uses of mobile phones to schedule or cancel appointments. He observed that Koreans traditionally could achieve personal success through three types of connections: blood ties, regional ties and school ties. Also, Korean culture tends to value personal relationships more than official ones. Kim concluded that the hierarchical and collective characteristics of Korean culture provided conditions that were ripe for fast diffusion. More specifically, he found that patterns of getting together were changing, the range of participants in after-work meetings was broadening, meeting places were spreading out and the boundary of public and private space was changing. Especially among younger people, a contract to maintain silence when using public space is being challenged. The diffusion of mobile phones leads to the spread of nomadic life. People seem to be getting used to easy calls and easy appointments.

With the virtually universal use of mobile phones in South Korea a number of social changes are occurring. Because the nation has a well developed and comprehensive system of public transportation, levels of certain types of mobile communication such as SMS messaging are higher than a country like the United States, where most people drive private automobiles. Mobile phones have also become fashion accessories as LG, Samsung and the other handset makers competed on the basis of color, shape and features, with some emphasis on the female market. The emphasis on feature phones was dominant until arrival of Apple’s iPhone in November 2009.

Social Networking and Cyworld

Thanks in part to the earlier completion of high-speed broadband networks, South Korea pioneered in the field of social networking, as this phenomenon swept through the nation’s internet about four years before it reached the United States. Nothing illustrates South Korean’s comfort with cyberspace and its new media environment better than Cyworld, launched in 1999 and the nation’s equivalent of Facebook which came along four years later in the United States.

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452 Kim, Shin Dong “Korea: Personal Meanings” Chapter 5 in p. 73.
As of late 2008 nearly half of the country’s population, 90 percent of Koreans in their 20s, and many socialites or celebrities used Cyworld. Young people, when meeting for the first time would frequently ask for another’s "cyaddress" rather than their phone number. Some 40,000 companies, non-profit organizations, government agencies, and universities had joined Cyworld to promote their businesses and activities.\(^{454}\)

Cyworld was originally intended to facilitate trust-oriented information sharing among university students and young workers, based on the idea of a personal resource program. As the founder of Cyworld noted, “Personal resource is unique. It accumulates as the person ages. Everyone has it regardless of how many financial resources they may have access to. The personal resource is exchanged through social networks.”\(^{455}\)

Unlike its western social networking equivalents, *Cyworld* has cute avatars and ‘mini-rooms’, known as *mini-homepi*, that are interconnected with other friends’ and family pages. Friends can visit other friends’ mini-rooms which are places in cyberspace that often reflect offline spaces. As one researcher noted, although Cyworld’s mini-rooms are filled with cute customization which might be seen as childish in a Western context, in Korea the cute content is consumed by both young and old users.\(^{456}\) Koreans seem to associate the cuteness with part of “...a struggle to humanize and socialize technological spaces, to highlight the mediated role of intimacy regardless of technological interference.”\(^{457}\)

Cyworld mini homepages encompass a photo gallery, video, message board, guestbook, friend list and personal bulletin board. Users personalize their "rooms" with digital furniture, art, home electronics, wallpaper, and music. All these digital items are sold for anywhere from 20 cents to $9. Members cultivate on and offline friendships through buddy (*il chon*) relationships in which one’s mini-hompy can be linked to another’s. Cyworld uses its own virtual currency called the *dotori*, which means acorn. As of 2006, one acorn cost 100 won and prices online varied from two acorns for a wall painting to six acorns for a song. At that time, Cyworld’s daily revenue from sale of acorns was estimated to be about $300,000.\(^{458}\)

\(^{454}\) Hall, Kenji, Moon Ihlwan, and Bruce Einhorn, “In Asia, MySpace Clones Stalk Cyberspace,” Business Week, September 11, 2006. [http://www.businessweek.com/technology/content/sep2006/tc20060911_808191.htm](http://www.businessweek.com/technology/content/sep2006/tc20060911_808191.htm)


Cyworld is owned by SK Telecom, Korea's largest mobile carrier, so many Cyworld users regularly logged on with their phones, well before mobile broadband usage started to take off in South Korea in 2010. To encourage loyalty and use of mobile phone service SK allowed users to post as many photos as they like, a very popular service given the almost universal use of camera phones.

In August of 2006 Cyworld officially launched a version of its site in the United States. However, that effort at market entry had failed by the Fall of 2008.\(^\text{459}\) This was another powerful illustration of the strong role that culture and language play in the shaping of cyberspace.

**Political Culture in South Korea**

The diffusion of broadband internet and mobile communication in South Korea had a profound impact on the nation’s politics. Three major events since the turn of the century illustrate this change.

The first was South Korea’s presidential election in 2002, which took a turn that surprised many. When a U.S. military court acquitted two soldiers whose armored vehicle had run over and tragically killed two schoolgirls in the Spring of 2002, that incident sparked candlelight vigils and anti-American protests in major Korean cities later in the year.

President Roh Moo Hyun, who won the 2002 election, was originally seen by many as a political novice and maverick with little chance of winning against more experienced, better known candidates. However, many in the younger generation, age 20-40 saw him as anti-establishment and revolutionary.

One of the major factors in Roh’s victory was the political fan club called “Rohsamo,” which literally means “those who love Roh.” Significantly, this group was a movement built around an online presence. By July of 2002 the group had reportedly grown to about 49,000 members.\(^\text{460}\)

On November 15\(^\text{th}\) 2002 the presidential election campaign took a dramatic turn as Roh Moo Hyun and Chung Mong Joon announced an alliance to back Roh for the presidency. At that time both of them were trailing the leading candidate, Lee Hoi Chang, by significant margins. However, just a few hours before the election started in December, this alliance broke down with Chung withdrawing his support for Roh. Upon hearing this, members of Rohsamo organized a last-minute mobilization of voters, using internet bulletin boards, e-mail, SMS text messages and phone calls. They also monitored exit polls. Patterns of voting on election day seem to support the notion that their efforts helped Roh win, as he was trailing in the morning voting, then took the lead and swept to victory later in the day.


Roh called himself the first “internet president” and in a very significant gesture, at least symbolically, he granted his first post-election interview not to a major television or newspaper outlet, but to Ohmynews the web-based newspaper with citizen reporters that had so staunchly endorsed and supported Roh.

A second illustration of the influence of the new digital media on South Korean politics came in the Spring of 2008. Another candlelight vigil movement sprung up in South Korea, sparked in part by an MBC television documentary about the threat of mad cow disease from eating imported U.S. beef. Candlelight vigils, initially led by young middle and high school students and their parents, spread rapidly and continued for several months, almost paralyzing the new government of President Lee Myung Bak.

A third occurrence that underscored the new role of the internet in politics was the controversy that arose over the web postings by someone who came to be known through his alias, “Minerva.” Park Dae Sung criticized and angered the Korean government while attracting a large following with his economic predictions on the internet.

For months, Minerva attracted the attention of South Korea with uncannily accurate predictions. He correctly predicted the collapse of the U.S. investment bank, Lehman Brothers, the crash of the South Korean currency, and the effects on South Korea of the subprime mortgage crisis in the U.S. In some of his hundreds of online postings, Minerva unleashed scathing attacks on the South Korean government’s response to the global financial crisis.

When some of his predictions proved accurate, some readers dug up his earlier accounts and eagerly waited for more. A national television anchor called on the government to heed his advice. Bookstores gave special displays to economics books recommended by Minerva.461

He was arrested in January 2009, but released in April after a court acquitted him of charges he used the internet to maliciously spread false information. The crime of spreading false information in public with a harmful intent is punishable by up to five years in prison. Some of Mr. Park’s postings contained factual errors and the government accused him of undermining the financial markets.462

Although acquitted by the court, on his release Minerva was sharply criticized for not being the authority figure most people had imagined him to be. In an interview from his hideout in Seoul, where he sought to escape from reporters and even online death threats, he said, “I am disillusioned and disgusted. I have

seen the madness of Korean society. I can’t live here any more. I want to emigrate.”

The Dark Side of the Information Society

While most people would argue that the information highways and byways that now extend their web throughout South Korea have been largely beneficial to people, there is a dark side to these developments. Its nature and dimensions are becoming better known. It includes internet addiction, various forms of cyber crime, and the like.

Internet Addiction

Because of early and universal access to broadband internet, Korea was among the first countries to identify internet addiction as a mental health issue. In September of 2007, South Korea held the first international symposium on internet addiction. On that occasion, Koh, Young-Sam, head of the government operated Internet Addiction Counseling Center said “Korea has been most aggressive in embracing the internet. Now we have to lead in dealing with its consequences.”

A 2008 editorial in The American Journal of Psychiatry described internet addiction as “a compulsive impulsive spectrum disorder that involves online or offline computer usage and consists of at least three subtypes: excessive gaming, sexual preoccupations and e-mail/text messaging.” Following a three year government-financed survey of the problem, Hanyang University child psychiatrist Ahn, Dong-hyun estimated that up to 30 percent of South Koreans under age 18, or about 2.4 million people, were at risk of internet addiction. Such individuals spend at least two hours a day online, usually playing games or chatting. Of those, up to a quarter million probably show signs of actual addiction, like an inability to stop themselves from using computers, rising levels of tolerance that drive them to seek ever longer sessions online, and withdrawal symptoms like anger and craving when prevented from logging on.

As of 2007 the nation had trained 1,043 counselors in the treatment of internet addiction and had enlisted over 190 hospitals and treatment centers. In the summer of 2007 it started an internet-rescue boot camp in which drill instructors drove young men through a military-style obstacle course, counselors led group

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sessions, and there were therapeutic workshops on pottery and drumming. All of this to battle a new addiction: cyberspace.467

**The Case of Lee Seung Seop**

In the Summer of 2005, Lee Seung Seop, who worked as a repairman on industrial boilers by day in the southeastern city of Taegu, fell off his chair after a 50 hour binge playing the online game “World of Warcraft.” He died a few hours later, and according to a psychiatrist at Taegu Fatima Hospital “He was so concentrated on his game that he forgot to eat and sleep. He died of heart failure brought on by exhaustion and dehydration.”468

South Korean authorities have linked several high-profile deaths to excessive Internet game playing. Some believe that cyber cafes have in effect become the opium dens of the 21st century, luring players into staying around the clock in disregard for their health and responsibilities. In May of 2005 a 4-month-old girl left alone at home in Incheon died of suffocation while her parents were playing at an Internet cafe. The couple told police they were thinking of playing just an hour or two, but the game took longer that day. They were charged with involuntary manslaughter.

Researchers speculate that the games are especially appealing to some South Koreans who live in small apartments with little physical and psychological space of their own. Although people of both sexes and all ages play, most prevalent are lower-middle-class males in their 20s with unsatisfying professional lives.

Lee Seung Seop seemed to be a case in point. He came from a poor family, attended a vocational college and after graduation worked in a drab, walk-up office. Lee was fired about six weeks before his death after repeated warnings about being late for work. Around the same time, he split up with his girlfriend. The last weeks of Lee’s life were spent largely in a PC bang. He was among the hard-core gamers who often stayed through the night, eating instant ramen noodles in front of his computer and napping in his chair. Lee died on a Friday night. He had been at the keyboard since Wednesday.

With cases like Lee’s, the industry has become more aware of the potentially addictive nature of its product. NCSOft Corp., South Korea’s largest game developer, has put warnings in its popular “Lineage” and “Lineage II”

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games alerting players that after an hour online, they ought to take a break for the sake of their health. 469

**Control of Language in Online Games**

The Korea Game Industry Agency’s ongoing efforts to control the language used while playing online games offers an interesting illustration of the challenge posed in efforts to clean up the internet. Many of South Korea’s online games offer a feature that allows the player to chat with other players. This raises the possibility of indecent, foul or abusive language. Therefore, the Korea Game Industry Agency published a list that identified more than 8,500 words that the agency recommended online game companies ban.

Efforts to control the vocabulary used online have created some controversy, with some users of games claiming that it makes chatting much more difficult. For example, try telling other gamers “I have to sleep now” after hours of laborious cyber battles. The chat box might prevent one from doing so, depending on how the sentence is arranged, as the Korean word for “sleep” includes a form that spells identically to a word for a human sex organ. 470

KOGIA said it selected words that were lewd, violent, discriminatory and possibly used for gambling. However, the wealth of everyday language included in the extensive list could be seen as borderline comical.

One game player noted that “Banning words doesn't make much of a difference, as you can always deliberately misspell to get the words through. And what are you going to do about voice chats? The restrictions just annoy everybody as they interrupt even the most casual conversations.” 471

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**Cyber Crime in Korea**

Criminals do not need a computer to commit fraud, traffic in child pornography and intellectual property, steal an identity, or violate someone's privacy. All those activities existed before the “cyber” prefix became ubiquitous. Cybercrime, especially involving the Internet, represents an extension of existing criminal behaviour alongside some novel illegal activities.\(^{472}\)

In early 2009, there were press reports of increasing activities by cyber-gangs, based in China, affecting Korean internet businesses. Servers receive a Distributed Denial of Service (DDos) attack, followed by a blackmail message that asks for a certain sum of money to stop the attack. For example, the owner of a flower delivery service named K, received a blackmail message. He disregarded it and his server was hit with a DDos attack. He was able to avoid further attack by transmitting 3 million won to the attacker. Industry insiders say that these types of attacks began in 2008 and that there were ten or more occurring each month.\(^{473}\) In 2007 the government reported that 1,823 or 1.1% of organizations surveyed experienced damage from denial of service attacks.\(^{474}\)

Korea’s National Information Society Agency has collected data over the years on various adverse effects of informatization. These include hacking, worm or virus attacks, personal information breaches and spam.

**Hacking**

As shown in Figure 8.5 the number of hacking attacks recorded in South Korea increased in tandem with broadband internet growth, but reached a peak in 2005 and then began to decrease. The decrease can be attributed to better implementation of basic security measures as awareness of the problem became more widespread.

**FIGURE 8.5 ABOUT HERE**

**Malware**

Malware is a general term for software inserted into an information system that can cause harm to that system or other systems or can subvert them for use other than that intended by their owners. Different types of malware are described as worms, viruses, Trojan horses, backdoors, keystroke loggers, rootkits and spyware.\(^{475}\) Studies by Google and other organizations lead to the

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conclusion that about 80 percent of all web-based malware is being hosted on innocent but compromised websites, unbeknownst to their owners.\footnote{Computer Viruses and other Malicious Software: A Threat to the Internet Economy, OECD Report, March 2009, p. 24.}

Virus infections and various forms of worms and malware are a continuing problem in South Korea. One of the main reasons is that there are still a large number of computers with internet access that are not using proper anti-virus, malware and firewall protection.

In 2007, a comprehensive survey showed that sixteen percent of establishments in South Korea had experienced damage from an attack by a computer virus, worm or Trojan horse. This amounted to approximately 36,000 establishments.\footnote{2008 Yearbook of Information Society Statistics, National Information Society Agency, part 6.}

**Botnets and Broadband**

Ironically, South Korea’s position as a world leader in broadband internet exposes it all the more to an increased threat of botnets. The broadband transition to faster upload bandwidth via fiber could make the botnet problem more severe. A recent OECD report suggested that the potency of one infected computer on a fiber connection could be equivalent to 31 infected computers on DSL and 44 computers on cable networks. Furthermore, with changes in spamming techniques over the last few years, there is a correlation between botnets and spam. Attackers have found it convenient to cooperate with spammers by using their e-mail lists to send mass quantities of spam, which often contains malware as an e-mail attachment, through botnets.\footnote{Computer Viruses and other Malicious Software: A Threat to the Internet Economy, OECD Report, March 2009, p. 33.}

In an effort to reduce damage from botnets, two measures were undertaken in Korea. First, to reduce damage from vulnerabilities in the widely used Windows operating system, the Korea Internet Security Center (KrCERT/CC) and Microsoft Korea collaborated to develop and deploy the Automated Security Update Program (ASUP) to home and small business users. When users visit major Korean websites, such as portals or online game sites, a pop-up window appears on the screen to confirm installation of the ASUP. A user only needs to click once, without modifying the Windows automatic update settings.

The second measure was adoption of the sinkhole system. It works to prevent botnets from connecting to botnet command and control servers by subverting the IP address of such command and control servers. The botnet infection rate in Korea dropped considerably following adoption of the sinkhole system in 2005.

A third counter measure being used in Korea is the use of MC Finder, which detects malware on compromised websites. As of 2008, MC Finder detected malware on an average of 500 websites per month. The Korea Internet Security
Center was sharing such malware patterns with Google and three major Korean web portals.\footnote{479}{Computer Viruses and other Malicious Software: A Threat to the Internet Economy, OECD Report, March 2009, p. 175.}

**Cyber Warfare and DDOS Attacks**

Despite all the efforts described above, on July 4, 2009 a wave of cyber-attacks was unleashed on 27 American and South Korean government agencies and commercial web sites. In South Korea, at least 11 major sites slowed or crashed, including the presidential Blue House, the Defense Ministry, the National Assembly, Shinhan Bank, the mass circulation newspaper Chosun Ilbo, and the internet portal Naver, according to the government’s Korea Information Security Agency. In the United States, the web sites of the Treasury Department, Secret Service, Federal Trade Commission and Transportation Department were all affected and the White House was also included in the attacks.

South Korea’s National Intelligence Service released a statement saying that "This is not a simple attack by an individual hacker, but appears to be thoroughly planned and executed by a specific organization or on a state level," adding that it was cooperating with the American authorities to investigate the attacks.\footnote{480}{Choe, Sang-Hun, “Cyberattacks Jam Government and Commercial Web Sites in U.S. and South Korea,” New York Times, July 8, 2009. http://www.nytimes.com/2009/07/09/technology/09cyber.html?scp=1&sq=July%204%20cyber%20attacks&st=cse}

Months later, in October of 2009, the head of Korea’s NIS testified before the National Assembly that in tracking down the routes of the July DD0s attacks, his agency had found a route coming from China. This turned out to be an IP that North Korea’s Ministry of Posts and Telecommunications was renting.\footnote{481}{Kim, Sue-Young. “Spy Chief Says Cyber Attacks Work of North Korea,” The Korea Times, October 30, 2009. http://www.koreatimes.co.kr/www/news/nation/2009/10/113_54596.html}

Suspicions that North Korea or a group loyal to it was behind the cyber attacks have been raised before. Yet South Korean intelligence officials kept the source of the attacks under wraps even though they confirmed it, revealing it only during the National Assembly audit, apparently because of China’s involvement and the possibility of exposing the extent of the South’s intelligence gathering capabilities.\footnote{482}{“Cyber Security is Vital for National Defense,” The Chosun Ilbo English edition, November 6, 2009. http://english.chosun.com/site/data/html_dir/2009/11/02/2009110200788.html}

**Personal Information Breaches**

An adverse effect of particular and growing concern in South Korea is the theft of personal information on the internet. This is especially a concern given the extremely high levels of internet banking and other forms of e-commerce and e-government. As shown in Figure 8.5, except for a slight drop in 2005, these
incidents have been growing at a steady and somewhat alarming rate over the past seven years.

**Spam**

As in other countries where internet usage is at high levels, Korea faces a continuing problem with Spam, both to regular e-mail accounts and in the form of calls to mobile phones. In recent years, Korea has appeared on the list of top spam-relaying countries. For example, the security firm Sophos, the United States ranked first in the world, relaying 13.1 percent of global spam, followed in order by India which relayed 7.3%, Brazil 6.8% and South Korea 4.8%. Although these four countries led the world in relaying of spam, they accounted for only a little more than 30 percent of global spam.  

In short, as this chapter demonstrates, Koreans are interacting with their many new digital networks and sources of information with a certain amount of enthusiasm and passion. The media ecology in South Korea today is certainly unprecedented in the world for the sheer number of channels and different messages it allows. The mix of a homogeneous culture with a single language, a distinctive and scientific alphabet well-suited to computerization and informatization seems to energize the emerging information culture of this land. Korean people and their culture are passionate. That passion comes through in many ways, through music, dance, movies and the arts.

With its export-oriented economy and success in hosting international events such as the Olympics, International Expositions and the World Cup, Korean culture has firmly engaged with most nations in the world and with processes of globalization. Along with the information revolution and globalization come certain adverse effects. Yet one cannot escape the conclusion that the heart and spirit of Korea’s culture, including information culture will survive and thrive in the global information society.

**Cyber Bullying**

The phenomenon of cyber-bullying is by no means unique to Korea. It has been experienced all over the world and bears a close association to the rise of social networking. The main distinction South Korea can claim, as with the malady of internet addiction, is that it began to experience the problem about four years before the United States did. That is the approximate time lag between the introduction of Cyworld in Korea and the corresponding start of Myspace or Facebook in the U.S.

On October 2, 2008, Choi, Jin-sil a 39-year old movie star who was considered by many to be a national sweetheart, committed suicide and was found dead in her apartment. The police, the media and even members of the National Assembly immediately pointed fingers at the internet. After studying memos

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found at her home and interviewing friends and relatives, police said that malicious online rumors had led to Ms. Choi’s suicide. The online accusations claimed that Ms. Choi was a loan shark and that a fellow actor Ahn Jae-hwan, was driven to suicide because she had relentlessly pressured him to repay a $2 million debt.

Choi, Jin-sil’s suicide led to a debate in the National Assembly over how to best regulate the web. In a month-long crackdown on online defamation, hundreds of agents from the government’s Cyber Terror Response Center began scouring blogs and online discussion boards to identify those who “habitually post slander and instigate cyber-bullying.”

In order to deal with the problems of cyber bullying and misinformation on the internet, the Korea Communications Commission in the Fall of 2008 mandated that all internet sites with more than 100,000 visitors impose real-name registrations for their message boards and chat rooms beginning in April of 2009. On that date, an amendment to South Korea’s Act on the Promotion of Information and Communication Network Utilization and User Protection went into effect and Korea became the first country in the world to implement a “real name” system under which any South Korean can post comments only after they enter their national registration number. One example of this policy was that Korea became the first country in the world where Google requires real name identification for its YouTube Korea site. Prior to April 1, 2009 users of Google Korea were able to post materials simply by giving an ID, a password and an e-mail address. Google’s head office reportedly explored various means of bypassing the “real name registration system,” arguing that freedom of expression should be experienced globally by all users. Google even at one point suggested shutting down YouTube services in South Korea. The country director of Google Korea said that “Google respects users' rights and freedom of expression to the fullest, and at the same time it also respects local regulations.”

**Warm and Emotional Technology**

Despite being one of the first nations in the world to experience the problems presented by the new digital media, it is the warm, human and positive side of the information society that dominates public discourse in South Korea today. This can be seen in television and media programming, on the internet, and through many forms of advertising and promotion. Nowhere is it more apparent than in the Ubiquitous Dream Hall (UDH), an exhibition arranged by the Korean

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government and major IT industry groups to showcase present and future information technology applications. Joukhi recently examined the UDH in terms of the visual and textual rhetoric being used in Korea to promote the vision of a ubiquitous network society.

The Ubiquitous Dream Hall is a permanent exhibition organized jointly by the Korean Ministry of Information and Communication and leading Korean IT companies to showcase and promote their core technology and products for domestic, public and office use. It was opened in 2004 and is located in the center of Seoul. The exhibition is divided into three areas with distinctive themes: “Home,” “Public Place” and “Office & Communication.” The nineteen stops on the UDH visitor’s tour introduce, for example, a smart home with applications related to security, household logistics and entertainment. There are also examples of future office appliances, transportation, robotics and mobile communication technology.

Joukhi’s study found that “In contrast to many popular visions of technology as cold and heartless machinery, the UDH presents a vision in which technology adds warmth to everyday life by implementing ubiquitous computing applications. The technology is not sterile or remote but it is all around us, accessible anytime, and it cares for us. The heart of technology as well as of Korean society is the home, and the future Korean home is empathetic.”

However, Joukhi questions the lack of real connections between the warmth and emotionality and the technology in the vision of the UDH. Especially so since Korea’s large technology companies and the government are also the very organizations that make their employees work the sort of hours that make even the Japanese look lazy. Yet he notes that emotional technology sounds refreshing, to say the least. It could represent a real paradigmatic change in the development of technologies and how people relate to them.

In Korea the information society has met with Confucian society. The result is uncertain, but one might reasonably imagine a Confucian society of the future in which the benefits of holistic control and benevolent and perhaps emotional surveillance win out over critical Big Brother discourse.

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Building an information society is a human endeavor and at its very heart involves language, culture and communication. The topics broached in this chapter at least reinforce that point, even if they raise more questions than they answer. One finding seems quite certain. That is the strength and resilience of the Korean culture in the face of rapid and sweeping technological change and development. Beyond resilience, the manner in which Korea’s language and culture are shaping its information society should be a profoundly hopeful sign to those in other nations around the world. It suggests that the future global information society may after all, encompass the diversity and richness of human languages and culture.
Chapter 9: Innovation Nation: Korea in the Global Information Society

South Korea’s digital development is part and parcel of a larger effort to build the global information society and is inextricably bound up with processes of globalization. The past three decades coincide with the so-called “third wave” of globalization which was driven by two main factors. The first was the technological change leading to lower costs for computing and communications (and international travel) that made it economically possible for firms to locate different phases of production in different and far away countries around the world. The second factor was the increasing liberalization of trade and capital markets.

Earlier chapters introduced the role of globalization in Korean education generally, and in research and development more particularly. They also noted Korea’s increasingly active involvement in and recognition by international organizations, led by the ITU, the OECD and the World Bank. In this chapter we expand our treatment of the global aspects of Korea’s digital development to include innovation, trade, the country’s large chaebol business groups, and the harsh reality of national division.

Trade and Innovation in Korea’s Digital Development

Trade and innovation are increasingly recognized as necessary for sustained economic growth and prosperity for all nations, both developed and developing. As noted in the foreword to a recent OECD-World Bank Study, “We often think of innovation in terms of breakthrough inventions, but it can also be linked to organizational changes and technology diffusion. In a globalized world, in which countries and firms compete fiercely to buy and sell their products and services, innovation is a key driver of competitiveness.”

Noting South Korea’s success in catching up with other OECD countries and reaching the technological frontier, the study benchmarked Korea to assess how well China, Brazil and other emerging economies were doing.

A key portion of the study, entitled Innovation and Growth: Chasing a Moving Frontier, argued that Korea’s catch-up strategy involved a combination of interventions to promote export-led growth and support for innovative industries. “Growth in certain industries was powered by Korean exports. Between the early 1980s and 2004 the share of output exported increased from 38% to 64% in electrical machinery, which was Korea’s leading industry, and from 5% to 33% in

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transport, its second largest industry. The overall share of exports in GDP increased from 23% to 43% between the 1970s and 2006.”

**Korea’s Changing Position in the Global Electronics Industry**

As of 1985, the United States produced 45 percent of the world’s electronics products, and Europe 21 percent. Japan’s share was 24 percent and it produced over 50 percent of the world’s audio and video equipment. Since that point in time East Asia has emerged as the world’s dominant center of electronics production. By 2005 China and the nine major developing Asian countries accounted for 43 percent of worldwide production of electronics products.

As discussed below, the geographic shift toward Asia was accompanied by growth of trade, establishment of global production networks a shift away from OEM manufacturing and innovation, especially in key industry sectors. In addition, Korea’s ICT industry itself experienced other dramatic changes, from the mid-1990s. It saw the rapid rise of the telecommunications equipment sector, and a shift in export destinations related to shifting production patterns.

**Global Production Networks**

The growth of electronics production in Asia was accompanied by an equally impressive growth in electronics trade. The region’s emergence went hand in hand with the development of global production networks in electronics. Most finished electronics products today are modular, and as costs of communication and transportation have decreased, flagship companies in the U.S., Japan and Europe, along with Korea’s large companies, have fragmented their production chains vertically and off shored manufacturing activities to labor-abundant countries. For example, in 2009 Samsung Electronics manufactured television sets or LCD displays at its manufacturing facilities in Mexico, India, Hungary, Indonesia, Slovakia, and Brazil. In 2004 China overtook the United States to become the world’s largest electronics exporter. However, this development was not fueled by the growth of Chinese companies, but rather by the relocation of production to China by multinational corporations in the West, as well as in Japan and Korea.

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One result of this globalization is that it becomes more difficult to precisely credit one nation or one region with being the source of a particular product. A striking current example is the iPhone 4, launched in June of 2010. In Korea, media treatment of the launch featured extensive treatment of how the nation’s leading handset manufacturers would be able to compete in the marketplace with various Android-based and other smart phones. However, the story soon came out that many of the most valuable components of the iPhone 4 are made in Korea. The actual assembly of all these modular components into a finished iPhone 4 was being done in China.

**Shift Away from OEM Manufacturing**

Until the 1990s, the original equipment manufacturer (OEM) approach was the dominant pattern in South Korea’s electronics industry. Korean manufacturers conducted joint ventures and concluded licensing contracts with such international companies as Philips, Micron, Intel, Toshiba, Sharp, Fujitsu, AT&T, NEC and others. OEM contracts were particularly important as a route of entry into the electronics industry because OEM clients provided guidance on technological and quality requirements for their products, as well as providing a market for the end products, allowing Korean companies to achieve economies of scale. The disadvantages of OEM arrangements included lower profit margins, and a hindered ability to develop independent brand name recognition and marketing channels. The lower profit margins, in turn made it difficult to make the R&D and marketing investments necessary to build their own brand products.

**Changing Export Patterns**

According to OECD data, China, Germany, Japan, the Republic of Korea and the United States are the world’s largest producers of electrical and electronic products. Patterns of trade in this sector can be broken down further by examining data provided by the WTO. The following three commodity categories are of particular interest.

- Electronic data processing and office equipment (SITC Division 75),
- Telecommunications Equipment (SITC Division 76). This category includes mobile phones, flat panel displays and television sets.
- Integrated circuits and electronic components (SITC group 776). This category includes the exports by Korea’s semiconductor industry.

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As of 2004, the three categories of exports together accounted for 12.2 percent of Korea’s Gross Domestic Product.\textsuperscript{499} The following chart shows recent trends in the exports of these three industry categories.

Figure 9.1: Korea’s Exports of Electrical and Electronic Products  Source: WTO Statistics
Figure 9.1 shows clearly that the export of semiconductors (IC and Components) led the way from 1994-2000. A different pattern of exports emerges following the Asian economic crisis in 1997-98, in which mobile phones and flat screen displays and television sets (Telecoms equipment) take the lead and the semiconductor industry also recovers from its steep decline in 2001 which was the worst year-on-year downturn in the industry’s history. The data underlying this chart suggest that the Republic of Korea has continued to emerge as a major producer of finished electrical and electronic products, while maintaining a significant place in the production of components.

**More Innovation**

By 1997, South Korea had more than 27 R&D centers in the United States, most focused on electronics-related research, especially semiconductor research. That made Korea the 7th largest foreign investor in such U.S. facilities.\(^{500}\)

More recently a Canadian study attempted to measure the level of sophistication of a country’s electronics industry. Based on the technological sophistication of different electronics industry categories, they calculated a country’s technology index (CTI) as the production-weighted average of the sophistication levels of the electronics categories that it produces. When comparing South Korea with the other Asian economies on how much they have upgraded their CTI over time, the authors concluded that Korea had upgraded most rapidly and had become the CTI leader by 1998. This is shown in Table 9.1. Perhaps the most telling part of this picture is that only Korea, in the lead, and China are on an upward trajectory, while Japan and the other nations fall behind.\(^{501}\)

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<th>High-Sophistication</th>
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<td>Japan</td>
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<td>NIEs</td>
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<td>South Korea</td>
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<td>Taiwan</td>
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<td>Hong Kong</td>
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<td>High Income OECD</td>
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Source: Author’s Calculations based on Reed Electronics Research Data
Since 2000, the competitiveness of the Korean electronics industry has significantly strengthened, thus enabling it to take an ever-growing share of the global market quickly. As of 2007, Korea accounted for 7.1 percent of production of the global electronics industry, ranking fourth behind the U.S., Japan and China.

Meanwhile, 2007 exports of information technology products rose 8.9 percent year-on-year to US$124.9 billion, with imports up 10.1 percent to US$67.8 billion. The result was a trade surplus of US$57.1 billion, 3.8 times higher than the overall trade surplus. The IT manufacturing sector has achieved exports of more than US$100 billion for three consecutive years since 2005, with its annual trade surplus recording an all-time high in 2007.  

**Developments in Key Manufacturing Industry Sectors**

Korea is now a global leader in several key sectors of ICT manufacturing. These sectors include semiconductors, display and television sets, mobile handsets, and the parts and components industry. A brief review of current issues in each sector underscores how Korea is now operating globally at the technological frontier in each.

In the semiconductor industry, South Korea’s companies dominated the memory-chip segments of the market. As of February 2009, South Korea’s leading manufacturers of memory chips had opened up a significant technological lead over their overseas rivals. Both Hynix and Samsung Electronics announced the production of new DRAM chips using 40 nanometer technology, while major semiconductor manufacturers in other countries were still using older technologies.

Growth in exports of semiconductor-based goods has caused a surge in imports of semiconductors. Most of the non-memory chips used in the manufacture of best-selling products like mobile phones, digital cameras, FPD TVs and automobiles are not produced in Korea, so the manufacture of these products is dependent on imports. In 2007 the Korean semiconductor market was worth roughly US$38.3 billion in 2007, of which 80 percent - some US$30.8 billion - was supplied by imports.

As of 2008 the Korean semiconductor industry consisted of about 270 companies. In terms of sales, device companies ranked as the largest group, accounting for 60 percent or more of the total, followed by assembly, equipment, materials, and design companies, all of which were of the small-to-medium sized category.

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502 Need to footnote source here.


The Korean semiconductor industry is shifting its focus from memory to non-memory or system-on-a-chip (SoC) semiconductors. This will help Korea’s industry to provide total solutions for IT products. As the latest example of such an effort, Samsung provides Apple with the A4 chip that is used in its popular iPhones and iPad products. In June of 2010 Samsung Electronics announced that it would build a $3.6 billion expansion of its Austin, Texas chip plant to build a production line for system large scale integration (LSI) chips. The world LSI chip market was at that time dominated by Intel and was four times larger than the market for memory chips. Most of the chips produced on the new line would be for 3D television sets and mobile devices such as smartphones and tablet PCs.  

The display is a second sector of electronics manufacturing in which South Korea is a global leader, having overtaken Japan in 2002. The rapid development of this industry can partly be attributed to the fact that it achieved both the IT and mass production technologies during the period of transition from analog to digital technologies.  

The ratio of display exports to total electronics industry exports has been rising in recent years, increasing from 10.6 percent in 2006 to 14.5 percent in the first two months of 2008. In relation to South Korea’s total exports, displays accounted for less than one percent in 2003 and 2004, a proportion that had risen to 4.5 percent in 2007.  

The display industry encompasses television sets, mobile phones, computer displays and screens of all shapes and size. The success of smartphones and Apple’s iPad seems to suggest the logic of convergence toward a future in which \"every surface will be a screen.\"  

With rapid growth of the display industry, inbound foreign direct investment (FDI) by companies from advanced countries has increased, in recognition of South Korea’s technology level. They include Merck, Toshiba, Asahi Glass and 3M, among others. This trend is expected to increase as the industry moves into next generation display models. Another example of the global scope of the display industry is a recent agreement between Apple and LG display. In January of 2009, Apple and LG Display announced a long term agreement under which LG Display would continue to provide LCD panels for Apple’s notebooks and monitors for the next five years. The agreement called for a US$500 million initial payment to LG Display. LG also manufactured the display for the much-heralded iPhone 4 which prompted an interesting industry debate over which

507 Is there a specific person or document for this phrase?
handset screen was superior, Samsung’s AMOLED or the LG “Retina” screen used in the fourth generation iPhone.

In 2009 a Sungkyungwan University- Samsung Advanced Institute of Technology (SAIT) team announced that it had discovered a manufacturing process for large-scale nanomaterial films that could herald the production of flexible electronic devices. SAIT said that the breakthrough would allow the country to make a grab for the global electrode market, which is critical in making displays, and could strengthen Korea’s position in displays and semiconductors.509

The telecommunications equipment or apparatus industry constitutes a third manufacturing sector in which Korea is a global leader. As earlier chapters of this book made clear, the biggest single item in this industry sub-sector is mobile handsets. Korea’s entry into the mobile handset market was made possible by its decision in the early 1990s to adopt CDMA technology. Its major industry players subsequently became a dominant force in the global marketplace for mobile handsets while manufacturing an expanding array of attractive “feature phones” that became popular in North America, Europe and all corners of the world.

The telecommunications equipment category also includes the base stations, switching equipment and transmission equipment that is necessary for both wired and wireless networks. Although less visible than the fashionable mobile phones, electronic switches and network equipment are form a very important part of Korea’s exports.

Exports of communication equipment in 2007 stood at $31.8 billion, up 13.4% from the previous year and with two-thirds of that total being accounted for by mobile handsets.

Finally, the manufacturing part of South Korea’s electronics sector today includes a healthy sector that manufactures parts and components. Harking back to the situation Korea faced in 1980, it is now possible to note the spectacular success the nation achieved in revitalizing its electronics sector. Today South Korea is a world leader in the production and export of electronic components for the IT industry. The old days when all the components had to be imported from more technologically advanced countries are over.

Software and Content: Apps, Google, Games and TV

While manufacturing and export of ICT hardware has been one of Korea’s traditional strengths, there is widespread recognition that rests increasingly with software and content. This becomes especially apparent with reference to the rapid developments in mobile broadband, the challenge posed by Google, and the future of both the online games and television industries.

As described in some detail earlier, introduction of the Apple iPhone into South Korea’s market came late compared with most other countries and created a distinct “iPhone shock.” Part of this shock was the realization that the success of the iPhone had much less to do with the phone itself and everything to do with the number, variety and quality of the applications that consumers could utilize with the device. Indeed, the phone itself was manufactured in China, and virtually all of its most valuable components were made in Korea! Yet it was the software applications that caught the imagination of consumers and caused them to dramatically increase their use of mobile data services in Korea, as they had in other countries.

The initial market feedback from Korea Telecom’s experience with the iPhone indicates that the market for mobile applications will thrive in South Korea. As evidence, one need only look at the enthusiastic adoption of mobile apps by consumers and the success that a number of young entrepreneurs have had with the development of iPhone and Android applications. (add graf here with interesting example)

By all measures, Google shows up as the dominant search engine on the internet, worldwide. Industry estimates of Google’s share of the global search engine market range from over 60 percent to as high as 81.57 percent.  

In order to place Google’s worldwide dominance in some perspective relative to Korea’s internet activity, it is helpful to look at the overall internet audience worldwide. As of December 2008, China surpassed the United States and became the world’s largest internet market with almost 180 million total unique visitors, as measured by Comscore. The United States had 163 million 300 thousand unique visitors and was followed by Japan, Germany and the United Kingdom in rank order. South Korea ranked tenth with 27 million 254 thousand unique visitors comprising 2.7 percent of the total worldwide internet audience.

However, American web sites, led by Google, reach by far the largest internet audiences. Google sites reach 77 percent of the worldwide internet audience, with Microsoft ranking second at 64.2 percent, followed by Yahoo at 55.8 percent. The remaining top-ranked sites, except for China’s Baidu, are mainly American social networking, shopping or media sites.

Google’s significance extends far beyond its role as a search engine or web search portal. It is more like a global information utility, with the potential to be as dominant as AT&T, IBM or Microsoft once were.

Think for example of cloud computing. As of 2007, Google was rumored to operate on 500,000 servers in its data centers. Google is building what amounts to a virtual private network within the internet and completely interoperable with it. As Google’s bots crawl the internet, they are seeking to build a copy of as

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much of it as possible. The value added in its business model comes primarily from the value of search and of the applications that advertising revenues support.

Google’s ventures into the provision of content also bolster its success in search and advertising. Since 2001 it has launched or acquired Google News, Blogger, Google Earth, Google Maps, YouTube, the Android platform, the Chrome browser, Google Voice, and Google Books, to name some of its major ventures. Google Books was launched in 2002. By 2003, Google had refined a non-destructive scanning process and resolved many tricky technical issues involved in scanning books in 430 different languages.512 As of this writing Google has scanned the contents of more than 12 million books.513

Google’s accomplishments to date help to place in clearer focus the future of the internet and South Korea’s potential role in it. One thing seems very clear. Language is both a limiting factor and an opportunity for Korea. While the home-grown search engine, Naver, does outstandingly well in the Korean-speaking market, it most likely will not export well. As Cyworld already experienced in trying to enter the U.S. market, it is extremely difficult to export web services that appeal to Korean linguistic and cultural tastes to non-Korean markets.

However, Google’s efforts to date also underscore the opportunity that presents itself. Its programs are available in many nations and many languages, seeming to underscore the vast multilingual nature of the internet and cyberspace. Google Korea could well partner with a Korean company to digitize all of the books in Korea, and make them available to Koreans at home and abroad. Google’s encounter with the Korean government’s requirement for real-name registration to upload video and comments on YouTube, as discussed in Chapter 5, underscored the global nature of the internet but also illustrated business opportunities for Korea.

In one content sector, that of online games, South Korea has a running start and seems poised to be a world leader. One of the reasons for South Korea’s remarkable success in the game industry may well be that online games have their own language that is more or less universal. It doesn’t require a great deal of text translation to play World of Warcraft, Starcraft or Lineage. Rather, there is more emphasis on visual symbolism and such universal themes as good versus evil.

Starting in 1998, the government encouraged national game companies to participate in well-known international gaming exhibitions. This eventually led 300 companies to advance overseas.514

512 http://books.google.com/googlebooks/history.html
513 http://www.openbookalliance.org/2010/02/how-many-more-books-has-google-scanned-today/
In 2000, Korea hosted the World Cybergames Challenge in Seoul. It attracted 168,000 participants from 17 countries playing four game titles. The WCG has now become widely recognized as an international exhibition, attracting 1.5 million participants from 75 countries, competing in 12 game titles by 2007 and continuing to grow.

South Korea’s burgeoning online game industry has already exerted considerable influence in the global marketplace. In 2005, its total exports of game products were far larger than those of either films or television programs. As of 2009, game exports constituted fully half of all South Korea’s cultural content exports. Indeed, the nation’s most popular online role-playing and casual games have become very popular in other countries. The Korean game developer NCSoft dominated the global online game market when it released Lineage and Lineage II in 1998 and 2003, respectively.  

As noted in Chapter 6, the next big trend to hit the online games industry will be the advent of mobile games. Fully fifty percent of revenues from Apple’s app store are for games. In Korea, even before arrival of the iPhone, the iPod Touch had already become the country’s most popular multimedia player.

For most of the twentieth century the United States, with Hollywood, has been the world’s dominant source of films and television programs. For that reason, Noam has posed the question of whether internet TV will also be dominated by American content.

In addition to online internet games, Korea has shown some strength in the animation market. However, even if we assume a growing global market for animations made in Korea, many of these will be custom-made for English or other language markets.

The CEO of Google, Eric Schmidt has given numerous presentations in recent years on the future of the internet. He notes that there is an explosion of content, but so little awareness of what to do with it. He also notes the vast gap between what computers can do and how human beings thing, which is more insightful.

In an interview in late 2009, he suggested that within five years the internet would


be a real-time, broadband intensive, video and app-centric web dominated by Chinese language content.\(^{519}\)

Although future internet TV and video may be dominated by English and Chinese language products, there seems to be no reason, in principle, why Korean firms cannot thrive in that environment. The large population of overseas Koreans, in the United States, Europe and other parts of the world may indeed play an important role in building Korea's information society as the development of content and services become ever more critical.

**Korea’s Chaebol Groups**

Korea today possesses a diversified industrial structure, in no small part because of its large family-controlled conglomerates called chaebol. Because the chaebol tended to diversify into different industries, there are now large companies competing in several key industries, such as ICT, shipbuilding and automobiles. In fact, the definition of a chaebol group is a parent company, owned or controlled by a family or extended family, controls subsidiaries in various industries. As noted in a recent OECD study, the most striking success story in Korea’s industrialization has been the ICT industry, which has become competitive and globalized in a relatively short period of time on the back of strong exports.\(^{520}\)

Korea’s large chaebol groups have many affiliates. As of 2004, Samsung had 63, LG 46, Hyundai Motor 28, Hanjin 23, Lotte 36 and the list goes on. The structure of the chaebols was cited by the IMF as one of the main reasons for the 1997-98 Asian economic crisis. At that point they had diversified beyond their financial and technological capability, thanks in part to government protection. Consequently, they became a major target for reform. The government announced a number of requirements for corporate restructuring, including a focus on core businesses, the reduction of debt-to-equity ratios below 200% by 1999, dismantling of cross-credit guarantees among subsidiaries and management transparency.\(^{521}\)

Companies like Hyundai, Daewoo, Lucky Goldstar (now LG) and Samsung helped to develop and commercialize key digital technologies over the years. As they grew, so did exports, the nation’s GDP, and the proportion of private sector contribution to Korea’s national expenditure on research and development. The largest and most successful of the chaebol also became large transnational corporations with facilities for research, manufacturing and sales straddling the globe. In terms of international recognition and brand value, Samsung achieved greater success than the others, especially in the ICT sector.

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\(^{519}\) Keen, Andrew, “Google’s Eric Schmidt sets out the search engine’s future


Samsung Electronics

Samsung Electronics epitomizes the revitalization of Korea’s electronics industry that was originally planned at the start of the 1980s. It also underscores the theme of this chapter, Korea’s strong new role in the world as made possible in large part by digital information and communication technologies.

Samsung Electronics is now the most successful consumer electronics company in the world, and South Korea’s most profitable and visible company.522

Samsung was incorporated as a trading company in 1938 by Lee Byung Chull. Following the Korean War the company had to be rebuilt and in the 1950’s it entered into two manufacturing sectors: sugars in 1953 and textiles in 1956.

In 1977, NEC licensed Samsung-NEC to produce color picture tubes.523 Samsung expanded its OEM capabilities by adding two new products, VCRs and microwave ovens. Unable to gain foreign licensing for these products, the company used reverse engineering and succeeded in developing its own microwave in 1978 and VCR in 1979.524

Samsung Electronics is the largest Samsung Group company, with total revenues of more than $98 billion in 2008, and net income of $4.4 billion.525 In 2009 the Business Week/Interbrand survey ranked it as the 19th most valuable brand in the world, with a brand value of $17.5 billion. It was the top television brand and the number two mobile handset brand in the world.526

Samsung Electronics business highlights in 2008 included its status as a global leader in the following areas.

- Consumer electronics and premium home appliances, including digital flat panel TVs and monitors, audio and video equipment, cameras and camcorders, computers and peripherals, printers and multifunction devices, and home appliances.

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522 “As good as it gets?” The Economist, January 13, 2005.


• Mobile phones, mp3 players and turnkey telecommunications network solutions. The latter included delivery of mobile WiMax network equipment to major operators in the U.S., Japan, Russia and other markets.
• Memory, logic semiconductors, and hard drive storage systems.
• LCD panels for the TV monitor, notebook, and digital information display markets.527

Based largely on improved supply chain management, Samsung moved to the number one position in the global TV market in 2006 and in 2007 had 13.6 percent of worldwide TV sales, ahead of LG Electronics with 11.4 percent.528

Research and development is one of three elements in the core competence of Samsung Electronics, with the other two being technology and brand image. By 2004 Samsung had twenty R&D facilities around the world. As of the end of 2007 it employed 39,000 R&D engineers, up from 32,000 in 2005. Of these, 3,200 hold the Ph.D. degree. Samsung Electronics R&D expenditures increased an average of 18% per year between 2002 and 2006.

South Korea’s National Image and New Role in the World

As noted in Chapter one, Americans have traditionally exhibited a certain vagueness about Asia and Korea in particular. The reasons for this have to do with mainstream media attention to the Korean War and its aftermath, continuing national division, the ahistorical and crisis focus of media, and differences in language and culture.529

Ironically, such vagueness and misperception persists even as the internet produces a flood of messages including the powerful, moving images of television.530 With the spread of mobile phones equipped with cameras, ordinary citizens increasingly participate in the gathering and dissemination of news. In this new digital and instantly global communication environment, both national and corporate images assume greater importance than ever before. However, the users of the internet must still search for and select the information they will pay attention to. It appears that the processes of selective attention and selective perception are alive and well in the 21st century.

“Seoul to the World, the World to Seoul”: The Seoul Olympics as a Catalyst

The 1988 Seoul Olympics proved to be a catalyst that boosted South Korea’s digital development, and helped improve the nation’s image abroad. There were two major factors that contributed to the improvement in South Korea’s national image. First, as the largest regularly planned television and media event in the world, the Olympics provided viewers around the world with a first-hand glimpse of the new South Korea. Second, the 1988 Seoul Olympics marked an important turning point in South Korea’s relations with all of the world’s socialist bloc countries. While international media in general had paid scant attention to developments on the Korean peninsula, socialist bloc countries including the Soviet Union, nations of Eastern Europe, China and Vietnam had been completely cut off from contact with South Korea during the Cold War years.

Except for the non-participation of North Korea, the Seoul Olympics helped make the Roh Tae Woo administration’s “Northern Policy” a great success. The Seoul Olympics not only helped South Korea establish diplomatic, economic and cultural relations with the former socialist bloc nations, but they also boosted the nation’s public image in those countries. In that sense, the seeds were sown for the Korean Wave that would later sweep through China and other countries in the Asian region.

The “Korean Wave” and Cultural Exports

Starting in the late 1990s a “Korean Wave” (hallyu in Korean) swept through the Asian region and other parts of the world. This term referred broadly to Korean popular culture, disseminated primarily through the mass media. The Korean Wave included television dramas, movies, internet games, fashions, and popular music.

One researcher concluded there were three specific reasons for the Korean wave. First, South Korean popular culture expressed Asian values and sentiments which could easily be assimilated by other Asians. Second, the Asian economic crisis, widely referred to as the IMF crisis in Korea, forced television producers to seek out products that were cheaper than Japanese or Western products. One such product, soap operas, became the starting point for the Korean Wave in Taiwan. Finally, a third reason was the self-confidence and nationalism shown by Koreans through their popular culture and international events. Many survey respondents felt that Korean popular culture differed from others in that it expressed inner passion and powerful energy.531

The last of these factors behind the Korean wave was prominently illustrated during the 2002 world cup by the omnipresent crowds of red-shirted Korean fans

cheering on their national team. These images of the passionate Korean fans were beamed around the world in televised coverage of the World Cup.

Of course, we must note that the advances in communications technologies themselves are a major factor in the spread of popular culture within Asia and around the world. The new digital networks, with their constantly increasing bandwidth, simply allow for more content and a more diverse range of cultural products. Here in Korea today, one of the major differences between the new IPTV services and the older cable television is in the sheer number of channels provided.

While the Korean wave seemed to demonstrate clearly that consumers in other parts of Asia and the world are interested in Korean cultural products, the 2008 Beijing Olympics also showed another side of South Korea’s new presence in China. There were several expressions of anti-Korean sentiment by Chinese fans during the Olympics. The outbursts are traced by some to incidents that occurred when the Olympic torch passed through Seoul on its way to Beijing. On that occasion, Chinese students studying in Korea physically confronted anti-Chinese protestors (over Tibet or the rights of North Korean refugees). These expressions caused some reaction by the Korean public.

Some observers note that the anti-Korean sentiments are evidence of the growing influence of the internet and its ability to fuel emotional nationalistic sentiments. In the real world, some practices by Korean businessmen visiting China in ever greater numbers have reportedly offended the Chinese. On the other hand, in Korea the melamine scandal and concerns over food safety became a major factor shaping images of China in 2008.532

In February of 2009 the Korean government unveiled a U.S. $91 million plan to boost the country’s pop music industry, including the building of two massive concert halls in Seoul. The five-year plan aimed to increase home consumption of pop music and to increase exports by globalizing the industry. Its goal was to approximately double the size of the market from 844 billion won to 1.7 trillion won.533

**Korea’s Future Image—ICT and National Branding**

The national image of any nation is an extremely complex phenomenon, consisting not only of popular culture and the mass media, but impressions of its citizens when traveling or doing business abroad, and the products and services of its major companies. Once events take place and are published by the news media around the world, the images of those events have a certain staying power.


A recent survey sponsored by the Korea Trade-Investment Promotion Agency (KOTRA) conducted in 21 countries around the world showed that the Korean government's image scored an average 3.31 points out of 5, which was lower than the citizen image at 3.62 points and corporate image at 3.55 points. According to a KOTRA official working on national brand management the frequent media exposure of North Korean missiles, demonstrations, strikes and the long lasting image of Korea as a divided country were some of the reasons that the impression of Korea’s government scored lower than that of citizens or corporations.

However, not all countries in the survey rated Korea low. Some of them that rated both Korean products and Korea as good were India, China, France, Brazil and Italy, and those that rated the country higher than its products were the U.S., Canada, Germany and Vietnam.534

The relationship between South Korea’s national image, considered as brand image, and the image of its products, people and culture was considered serious enough that in January 2009 a Presidential Commission on National Brand was launched. On that occasion it was noted that Korea's national brand value was negligible in comparison with its status as the world’s 13th largest economy. The national brand of the United States was valued at 143 percent of its GDP and Japan's at 224 percent, while that of Korea is valued at below 30 percent.535 According to the outcome of a 2007/2008 survey conducted by the Korea Trade and Investment Promotion Agency (KOTRA), Korean products were valued 66 to 67 percent less than their American counterparts. This "Korea Discount" phenomenon reportedly affected the prices of Korean products.

It is noteworthy that the first global promotional campaign recommended by the Presidential Commission on National Brand focused on Korea’s strength in ICT. Perhaps that and subsequent campaigns will help to make more people around the world aware that Samsung and LG, among others, are Korean companies. That would be appropriate insofar as the private sector, led by those companies, was largely responsible for South Korea’s rapid digital development, especially since the mid 1990s.

**National Division and the Digital Divide**

Any treatment of Korea’s place in the world today needs to acknowledge the tragic reality of continued national division. The political and humanitarian aspects of this division have been treated extensively by others. Here, we would like to underscore the growing disparity in communications infrastructure between North and South which is vividly symbolized by the widely disseminated satellite photographs of the Korean peninsula at night, one of which is shown in Figure 9.2. The bright lights in South Korea might just as well represent its abundant fiber optic and wireless digital networks next to the darkness in the

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North, which has earned the distinction of being the world’s biggest “internet black hole.” The digital divide on the Korean peninsula today has no equivalent anywhere else in the world.

From the pages of the Reporters Without Borders Website, [www.rsf.org](http://www.rsf.org) North Korea has perennially been dubbed the world’s worst internet black hole.
Figure 9.2
Korea was divided before the dawn of the information age. In 1945 there were no personal computers, communications satellites, cellular telephones or other appurtenances of the information era. The more recent information revolution has transformed the very meaning of Korea’s national division and sets the bar at a new level in terms of expectations for eventual reunification. Today, high speed internet and modern mobile communication are basic elements required to operate a modern market economy. Consequently, the media and telecommunications will be called upon to play a far larger role in Korea’s reunification than anyone might have imagined at the end of the Korean War.

Digital Divide: The Growing North-South Disparity in ICT Infrastructure

North and South Korea occupy the same peninsula and share a national history that spans thousands of years. Yet today there are few pairs of nations on earth that exhibit a greater gap in the level of development of communications industries and infrastructures than these two states.

Communications Infrastructure

An attempt to compare the telecommunications infrastructures of North and South Korea almost defies any quantitative comparisons. However, data on teledensity (the number of telephone main lines per 100 population) from the ITU show that as by 2007, North Korea had achieved a teledensity of 4.96, approximately what South Korea had 30 years earlier in the midst of its telephone backlog crisis.

In 1995 North Korea’s teledensity was about 5 percent of South Korea’s. Twelve years later, in 2007, its teledensity was ten percent as large as South Korea’s, but mainly because teledensity in the South had started a steady decrease in 1999, as people shifted over to mobile telephony.

The on-again off again story of mobile telecommunications in North Korea says volumes about the ambivalence that the country’s leadership has toward modern communication infrastructure. North Korea introduced mobile phone service in November of 2002.

In 2003, Chinese cellphone companies began building relay stations along the North Korean border, and Chinese cellphones - and the prepaid phone cards needed to use them – were reported to be a hot black market item in North Korea. In 2005 as many as 20,000 North Koreans were believed to have access to cellphones, which they used to conduct business with Chinese traders. That number, amounting to less than one-tenth of one percent of the North Korean

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population, would indicate that cellphone use was limited almost exclusively to government and military elites.

This situation continued until 2004, when the North Korean government banned the use of cellphones. The government ban came shortly after the April rail disaster in the town of Ryongchon, just 10 miles south of the Yalu River border with China. North Korean officials have suggested that the ban was intended to stop saboteurs from plotting against the North Korean regime. Kim Jong Il, whose train had sped through Ryongchon shortly before two trains collided and blew up, killing several hundred people is widely believed to have been the target.\(^{538}\)

Thanks to these phones, ordinary North Koreans could receive information about the outside world through Chinese business contacts or relatives in China and South Korea. Defectors now living in the South are able to maintain contact with people in the North.

This use came despite the risk of penalties, up to and including execution. In a 2008 White Paper, the Korea Institute for National Unification reported that the cases of public execution in North Korea had increased, noting that “Most frequently punished crimes were violations of communication laws involving mobile phones and video sales.”\(^{539}\)

In 2008, the government of North Korea again changed its policy toward mobile phones. In January, Egypt’s Orascom Telecom announced that it had won a 3G license to construct mobile phone networks in North Korea. This was reportedly a joint venture 75 percent owned by Orascom and 25 percent owned by North Korea’s state-run Korea Post and Telecommunications. In the announcement, Orascom said it planned to cover the capital, Pyongyang and other major North Korean cities during the first twelve months of operation.\(^{540}\)

North Korea’s notable achievements in telecommunications during the 1990s include the establishment in 1994 of a fibre optic cable factory in Pyongyang. The same year a cable network was completed between Pyongyang and Hamhung. In 1998, a fiber optic cable network was laid out from Pyongyang to Sinuiju, a distance of about 400 kilometers, with aid from UNDP. As of 2003, fiber optic cable networks connect over 200 districts (called kun) nationwide and were being extended to the smallest administrative units (called il).\(^{541}\)

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\(^{540}\) Reuters, “UPDATE 1-Egypt OT wins first N. Korea mobile phone licence,” January 30, 2008

A nationwide network or Intranet, called Kwangmyong, which means “bright light” was built in November 2002. The Central Information Agency for Science and Technology (CIAST), which is responsible for building and managing the Intranet, runs a portal site that is also called Kwangmyong. The portal offers a variety of services, such as database search, e-mail, website search, electronic library, real-time chatting, electronic commerce, and entertainment. This domestic network is open to the public in Pyongyang, the capital city. They call it the '170 Network', after its modem connection number. The modem speed is 56 Kbps. The network is also connected via fibre optic leased lines. It is used mainly for e-mail.

It is no coincidence that North Korea’s computer communications internally takes the form of a large intranet, using the fiber optic network that has been installed to link major cities. Actual connection to the internet is limited to a relative handful of elites in government and the military. In April 2004, an Internet café was opened through which ordinary people could use the Internet. However, access was reportedly limited to the domestic network; the real Internet being closed to the general public.

Although the Internet is recognized in North Korea as increasingly important, only the privileged are allowed to use it. North Korean leaders are concerned about the impact of the Internet on the stability of the regime. In an interview with Chosun Ilbo (3 October 2003), a North Korean newspaper, the president of Chosun Posts and Telecommunications Corporation, Mr Hwang Chol-Poong said that 'North Korea will not open the Internet due to the possibility of threats to the national security.' However, the North Korean government recognizes the potential economic value of the Internet. Thus, it faces the dilemma of whether to court political instability in exchange for economic gains by opening up the Internet.

The Implications of Korea’s Digital Divide

There are several clear implications of considering Korea’s division as a digital divide. First, because technological change and development of the information society are continuous processes, the infrastructure gap between North and South Korea tends to increase year-by-year, rather than decreasing. This means that the overall cost of removing the gap also increases.


Second, the digital divide between North and South is also a democratic divide. Leaders in South Korea during the 1980s believed that the information revolution would bring democracy to South Korea and history shows that has happened. In the North, however, there are still leaders who think that the information revolution can be somehow controlled, filtered or shaped to suit their own vision.

Third, as this chapter makes clear, the division of Korea until now has been a permanent part of South Korea’s national image and that of North Korea as well. Although we hesitate to make forecasts about when and how unification may take place, it is possible with some confidence to say that it will eventually come about. Furthermore, to fully realize Korea’s place in Northeast Asia and its future role in the global information society will necessitate unification. We will have more to say on this in the concluding chapter when we address the possibilities for Korea in cyberspace.

Finally, the digital divide on the Korean peninsula today makes communication a central element in any strategy for reunification. Galtung recently proposed an approach to unification that does not require unification of the two states. Instead, it only “necessitates the free flow of people, goods and services, information and ideas between the two Korean states.”

His approach at least seems to acknowledge the reality that, in the information society; information flows freely and is not confined to one class or another. Realization of this vision will be tantamount to the reunification of Korea.

\[545\] From Galtung’s lecture at Dong-A University in Pusan, as reported by http://www.radicalcontrapositions.com/left_flank/2008/03/19/unification-is-not-important/
A Hub for Northeast Asia?

The clear alternative to a divided Korea is unification, at some point in time and somehow. Without getting into the myriad political difficulties and obstacles to unification, we would simply note that full unification or even significant progress toward it opens up the prospect of Korea as a free trade zone and hub in Northeast Asia.

South Korea’s existing free economic zones, including the New Songdo development in Incheon, represent preliminary steps toward building Korea as a hub. Based on its track record of the past three decades, South Korea alone can make significant progress toward becoming a major regional hub. However, there is little doubt that unification will add strength to the effort in the long term.

A recent study by Goldman Sachs suggested that a reunified Korea could boast an economy larger than that of France, Germany and possibly Japan by the middle of the century. The economist who authored the study, Kwon, Goo-Hoon, suggested that the costs of reunification need to be re-evaluated in light of the rapid development of countries like Vietnam and Mongolia, which had state-run economies like North Korea. Both the Goldman Sachs study and a recent Bank of Korea report suggested that the two Koreas maintain separate currencies and restrict border crossings, perhaps for decades as the North Korean currency appreciates and its people grow wealthier. The study also noted that the North’s huge growth potential could help offset the slowing growth of South Korea, with its rapidly aging population. North Korea has large mineral deposits and a younger population that is growing faster than that of South Korea.” 546

Significantly, the Goldman Sachs study assumes a peaceful and gradual economic integration of North and South Korea. This assumption, the study notes, seems reasonable given the policy stance of the South Korean government and the international community, and the apparent lack of alternatives for the North Korean government other than economic reform and cooperation with neighboring countries. 547

These recent reports are in line with our emphasis on the growing disparity in ICT infrastructure between North and South Korea. They suggest that the North Korean economy is at a crossroads and note that South Korea is now the North’s largest trading partner, and that cooperation at the Gaesong Industrial Complex which accounts for about half of inter-Korean trade, continued even amid escalating tensions earlier in 2009.

North Korea’s options seem to be limited. The most expensive policy option for Korea, would be a German-style reunification. The least expensive and perhaps

most realistic for Korea, would be based on the model of Hong Kong’s integration with China.\footnote{Kwon, Goohon, \textit{Global Economics Paper No. 188}, Goldman Sachs Global Economics, Commodities and Strategy Research, September 21, 2009, p. 19.}

While we can only provide some empirically-based speculation on the question of Korea’s national reunification, we can be more certain of our conclusions regarding South Korea’s accomplishments. In the space of less than three decades and only ten years into the new century, South Korea has assumed a leadership role in the world’s evolving ICT sector and its efforts to build a global information society. The evidence we have summarized thus far makes that clear.

How far the nation will exercise that leadership and to what ends is the central question South Korea faces now. In the concluding chapter, we will look ahead into the future of cyberspace and Korea’s place in it.
Chapter 10: Korea’s Place in Cyberspace

“Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather.”

John Perry Barlow, A Declaration of the Independence of Cyberspace
February 1996

Our book traced South Korea’s efforts over the past three decades to build an information society. A key aspect of the nation’s digital development was the emergence of a realm called cyberspace. Among the earliest to venture into cyberspace were those who frequented Korea’s ubiquitous PC bangs to play such online games as World of Warcraft or Lineage. Then came such web services as Cyworld. On the whole, Koreans began to experience cyberspace years earlier and in far greater numbers than netizens from other nations.

Looking ahead, cyberspace seems destined to become increasingly important not only for Korea but also for the other nations, corporations and people of the world. What are the possibilities for a global information society and what will be Korea’s future role in cyberspace?

In this chapter we assess Korea’s place in cyberspace, starting with an examination of how cyberspace is commonly defined, including a Korean perspective on cyberspace. The second part of the chapter then moves to an account of how Korea strategically restructured its ICT sector to assume its present status. Some parts of the Korean experience may hold lessons for other developing countries who seek to emulate it. At the very least we want to summarize for the historical record some main dimensions of Korea’s experience with digital development. Finally, the chapter concludes with some suggestions about the future, which may have as much to do with Korea’s place in cyberspace as its role in the real world.

Conceptions of Cyberspace

The word cyberspace, which comes from combining cybernetics and space, was coined by science fiction novelist and cyberpunk author William Gibson in his 1987 story Neuromancer. He defined cyberspace as a “consensual hallucination.” Metaphorically, the term is now widely used to describe a social setting that exists purely within a space of representation and communication. It exists entirely within an electronic, computer space, distributed across increasingly complex and fluid networks. As used in academic circles and in the activist community, cyberspace has become a de facto synonym for the internet.

http://homes.eff.org/~barlow/Declaration-Final.html
Defining cyberspace is very much a matter of context. However, a common factor in virtually all definitions is the sense of place that they convey. Cyberspace is most definitely a place where you chat, explore, research and play.  

Cyberspace and Korea’s place in it will be a vital part of the future global information society, for at least three important reasons. First, as we have documented, South Korea built the information superhighways through which one enters cyberspace almost half a decade before the United States and other advanced economies. Once the digital networks were in place two new places appeared in the expanding cyberspace. One consisted of massive multiplayer online games (MMOG) that originated here, the best known of which is Starcraft. In the latest versions of such games, participants increasingly immerse themselves in the virtual worlds of the games. The second expanding space was social networking, as epitomized by Cyworld.

A second reason that cyberspace has profound importance for Korea has to do with the balance between manufacturing and service industries. To date, South Korea’s progress in digital development has been based largely on the manufacturing and export of hardware, including semiconductors, flat panel displays and television sets, mobile devices and network hardware. The networks and communications hardware are a necessary but not a sufficient condition for cyberspace. Three quarters or more of the global communications market has to do with software, content and service applications. These are the stuff of which cyberspace is made and it will be vital for Korea to seriously move into these areas, with the same sort of success it has achieved to date in hardware manufacturing and export.

A third aspect of cyberspace also underscores its significance for Korea. Its inherently global scope means that it poses a set of governance challenges for governments, corporations and citizens groups. Such issues are of particular importance to countries, like Korea, that export ICT products and services to the whole world. Simply put, Korea already has too much of a stake in cyberspace to sit idly by. Rather, it must be an active participant, as befits its recent experience.

**Discovering the Geography of Cyberspace**

Cyberspace is a new spatial realm that seems to be unfolding with almost limitless possibilities for the future. Accordingly, one of the key questions being asked about cyberspace is that of how we can discover its geography. One approach to answering this question is mathematical. Since the internet is a network of interconnected points, it can be readily examined using techniques from topology or graph theory. A second approach uses techniques from the field of geography, overlaying the structure of the internet on maps of the

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550 From course materials, Gary Stringer, University of Exeter, Conceptual Issues in Cyberspace, 2006-2008, [http://services.exeter.ac.uk/cmit/modules/cyberspace/webct/ch-philosophy.html#id690561](http://services.exeter.ac.uk/cmit/modules/cyberspace/webct/ch-philosophy.html#id690561)
physical world. The emergence of cyberspace raises some fundamental questions about the importance of borders versus the notion of a borderless world. These new borders, he notes, are unexplored, undemarcated and have few effective treaties. A third spatial aspect of the internet is the so-called “death of distance.” The degree of connectedness in human society is rapidly increasing due to the internet with its social networking and “six degrees of separation.” Cyberspace, of course is not subject to physical laws and real world constraints. This opens up the possibility, as already seen in computer games, where multidimensional worlds, hyperspace jumps and wormholes become possible.

**The Internet versus Cyberspace**

Though built on top of the Internet, cyberspace is a richer experience. Cyberspace is something you get pulled “into,” perhaps by the intimacy of instant message chat or the intricacy of massive multiplayer online games. Some in cyberspace believe they’re in a community; some confuse their lives with their cyberspace existence. Of course, no sharp line divides cyberspace from the Internet. But there is an important difference in experience between the two. Those who see the Internet simply as a kind of Yellow-Pages-on-steroids won’t recognize what citizens of cyberspace speak of. Some of this difference in perspective about cyberspace may be generational. Consequently, to understand the world the next generation will inhabit, it is necessary to understand cyberspace.

In Lessig’s analysis, spaces have values which are manifested through the lives that they enable or disable. The process of enabling or disabling depends upon the computer code that governs access to chat rooms, digital envelopes, internet gateways and other systems. People, who in real life might be blind, disabled or ugly, can overcome these limitations in cyberspace, depending on the architecture of that space. Codes constitute cyberspaces, which in turn enable or disable individuals and groups.

**Cyber space as virtual space**

Cyberspace differs from real space in that it is a virtual space. For example, massive multiplayer online game (MMOG) space is like a cartoon on television and may be three dimensional and increasingly immersive. However, unlike the cartoon, MMOG space enables you to control the characters on the screen in real time, interacting with other such characters being controlled by others in real

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552 From course materials, Gary Stringer, University of Exeter, Conceptual Issues in Cyberspace, 2006-2008, [http://services.exeter.ac.uk/cmit/modules/cyberspace/webct/ch-philosophy.html#id690561](http://services.exeter.ac.uk/cmit/modules/cyberspace/webct/ch-philosophy.html#id690561)


time. Users of MMOG space are able to define the space and live out their own stories. There is real life in MMOG space, constituted by how people interact in this virtual medium. In the 1990s terms people “jack” into these virtual spaces and do things there. An estimated 20 to 30 million people were participating in these virtual worlds.  

Another important characteristic of cyberspace is that, given the architecture of the internet, access to cyberspace doesn’t depend upon geography. The structure of the internet also makes it possible to enter cyberspace through anonymizing sites that make it practically impossible to trace a person’s real identity. This helps to explain why various forms of online gambling, pornography and such flourish. The growth of online games on the internet has produced opportunities for people to do things in the virtual world that they would never think of doing in the real world. This helps to explain why many of the most popular games, such as World of Warcraft, have a fantasy element to them.

**Cyberspace Sovereignty and Net Neutrality**

The question of sovereignty in cyberspace is a new and complicated one. Regulation of what happens in this space depends not only upon governments, corporations or citizens groups around the world, but also on the software code that controls communication on the internet. “Code codifies values, and yet, oddly, most people speak as if code were just a question of engineering. Or as if code is best left to the market. Or best left unaddressed by government. But these attitudes are mistaken. Politics is that process by which we collectively decide how we should live.”

Thanks to the development of cyberspace, ordinary citizens around the world are connected and can make international transactions as never before. The reality of new communities that go beyond any individual state is undeniable. Examples abound. Global Voices Online is a relatively new organization made up of bloggers and news reporters from countries around the world who are not covered thoroughly by the mainstream media.

Today’s “netizens” in Korea, if polled, would probably for the most part identify themselves as citizens of Korea, rather than “global citizens” or residents of a larger political entity. Likewise, overseas Koreans might identify with their country of citizenship, depending on their length of stay or generation of birth. Nevertheless, the growth of cyberspace exerts a pull on netizens to place their loyalties with other like-minded netizens around the world. At the current stage of its development, the internet and therefore cyberspace is the subject of a worldwide political battle. International laws, as they relate to cyberspace are increasingly significant because of the need for nations to arrive at a common

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understanding of this space and a coherent strategy for dealing with its regulation.

_Cybersecurity for People or for Nations_

Today’s internet is organized around independently managed networks, most of which are privately owned. On the other hand, as Mueller notes, the current institutional structure for public governance is organized around the nation state. Faced with this reality, some observers frame internet security or “cyber-security” as a national security policy issue, while others conceive of the internet as a global space where individuals and organizations interact and routinely confront issues of crime and vandalism.

The national-security approach is represented by a recent CSIS sponsored report from a “Commission on Cyberspace Security for the 44th Presidency.” That report, published in late 2008, urged the incoming president to proclaim that “cyberspace is a vital asset for the nation and…the United States will protect it using all instruments of national power.”

Another report, published by a Dutch research organization in collaboration with a U.S.-academic institute, framed the problem very differently, as follows.

“Because the internet has no natural political boundaries, national boundaries are not effective to partition cyber security policy responsibilities. And even though security is a basic public sector concern, and typically regulated at the government level, the bulk of the capability for dealing with cyber security risk is not in the hands of governments but lies with the private or semi-private sector entities that actually manage and operate the ICT infrastructure.”

The same report described a world in which those concerned with cyber security have to think about hackers, cyber-criminals, terrorists, and high-tech national security strategists.

_Korean Conceptions of Cyberspace_

Cyberspace can be thought of as the frontier built upon the infrastructure we call broadband internet. How then do Koreans, as some of the earliest settlers in that frontier area, view cyberspace and how does their vision compare with that of other nations or cultures? Although this subject can be a slippery one, it is

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important for leaders everywhere to struggle with the concept and to clarify their own vision of the future, knowledge-based society.

For Koreans who have difficulty understanding cyberspace, it may be helpful to think of it as a Utopia or a paradise. Then it is like the mythical Yi-eo Island that people in Cheju-do dream of. Cheju is Korea’s island province, located south of the peninsula and therefore enjoying a somewhat warmer climate. Residents of Cheju Island speak a dialect of Korean that cannot be understood by citizens on the peninsula. However, they share one trait with Westerners, Chinese and people all over the world. They have begun to imagine cyberspace. While westerners may imagine paradise, and the Chinese conjure up images of utopia, the Cheju-do residents think about Yi-eo island.

Traditionally, when the Chinese were troubled by the hardships of life, they imagined a utopia called the Happy Valley. In that valley, if you picked and ate the peaches they would bestow upon you eternal life. You could also put your feet in the clear water of a brook and if you imagine reciting the words shi han soo, it would comfort your spirit.

Westerners tended to look upward to Paradise Island. In that place there were only loving people and self assurance. Only two people existed and clusters of trees laden with ripe fruit added their fragrance to a blue ocean beach. If there were bitterness or rancor, a rainbow would appear. Also, in Paradise Island you could see across the whole world.

Not surprisingly, the corresponding myth for Koreans has to do with mountains. It can be found in the well known “Arirang” folk song. Arirang is by far the most representative and famous Korean folk song, and there are literally hundreds of versions of the song. In addition to the original version, there are Jindo Arirang, from Jindo in South Cholla province, Miryang Arirang from Miryang in South Kyongsang Province, and so forth. Fundamentally, all versions of the song are about the travails of the song’s subject crossing a mountain pass. An English translation of the basic lyrics is as follows

Arirang, Arirang, Arariyo...
I am crossing over Arirang Pass.
The man/woman who abandoned me [here]
Will not walk even ten miles before his/her feet hurt.\(^{562}\)

The theme of this folk song is that of love between a man and a woman, and its melodies and rhythms are very well suited to the Korean culture and character. The full meaning of this folk song is open to interpretation. However, in the instant that Arirang went over the ridge, it seemed as if a world of abundance and happiness unfolded---a place in which hunger and cold, disappeared and there was no grief or sadness.

Yi-eo Do, on the other hand, was an island imagined only by people in Cheju-do. Because of their own unique dialect of the Korean language they did not know

\(^{562}\) http://knowledgerush.com/kr/encyclopedia/Arirang/
about the Arirang myth. Instead, sailors who went to sea in their ships but didn’t come back were believed to have settled in Yi-eo Do. If one went to that place, all worldly troubles or cares would disappear. Once a person set foot there, only rest exists and it is believed he cannot return. Therefore, children believe in their hearts that when their father dies he is not dead but living in Yi-eo Do. Sailors occasionally feel an impulse to turn the bow of the ship and sail out to sea in search of Yi-eo Do.

Once, it was reported on Korean television that Yi-eo Do was actually discovered. However, if the actual location of the island were to appear on a map, that would not really be Yi-eo Do. The island exists only as a vision inside the minds of the people of Cheju-do. On that occasion when children long for their father, if they imagine Yi-eo Do, it seems they can meet him. Likewise, wives can meet their deceased husbands again in that place. Every day those sailors who have not reached that place, long for Yi-eo Do and thereby acknowledge that someday they will go there.

Such an ideal place is imagined in every country and among every people. The reason is that human beings want to live in a place where they can get rid of poverty, destitution, discontent with existence, and even violent labor demonstrations. If this is the case, it explains why another Yi-eo Do, called cyberspace exists.

Mainstream media reports on cyberspace feature noisy commercial businesses, stimulating or pornographic sex, and horrible crimes. By contrast, in healthy people’s cyberspace there are pleasant meetings, recreation, information and knowledge to satisfy a person’s mental needs. In twentieth century fashion cyberspace offered a form of escape. In the twenty-first century if the younger generations are exhausted, mentally running dry, and craving for knowledge, isn’t this the place to fulfill those needs?

Young people can benefit from using cyberspace as a place of refuge. As long as netizens behave themselves mentally when they enter that space, they can find a pleasant path. It is possible to visit new places, meet new people, and even find love. Together the citizens of cyberspace can become aware of knowledge they didn’t have and satisfy their curiosity about things they wanted to know. All requirements for knowledge and recreation can be met satisfactorily in cyberspace.

Today Yi-eo Do may have left the imagination of some people in Cheju Do. In contrast cyberspace has created something even more realistic than the real world. To that extent, the door to this place is wide; the climate is balmy and warm. However, today there are many obstinate people in Korea who play games day and night even to the point of dying from the exertion. In cyberspace there is ample opportunity for recreation and acquiring knowledge, yet these things cannot be more important than real life. Our recommendation to those who need an example of this is straightforward. Turn off the computer and the reality of life will return and your power of self control will expand!
The Cyber Path: Three Decades of Digital Development

Although Korea was not the only nation to take the cyber-path toward development, it was certainly the first. While it would be a mistake to assume that Korea’s experience can easily be translated to that of other developing nations, some aspects of it may be useful. After all, South Korea succeeded, beyond all expectations, in harnessing digital technologies for development. Its transformation was both sweeping and rapid. The following review of our main findings may help readers discern which lessons apply to their country and which are unique to the Korean experience.

Education, Human Resources

Any catalogue of the major influences on South Korea’s telecommunications revolution must begin with the importance of education, which is the basic process of the information age. As such, it is a pre-requisite for research and development, leadership and all the other key factors in Korea’s information revolution.

As documented in Chapter 4, education played a prominent role in Korea’s transformation in several different ways. First, the nation built up its infrastructure for formal education, a process that by the 1980s and 1990s came to focus on university-level education. Second, Korea strengthened its capacity for vocational education along the way. ICT is skills demanding and an essential tool for building a knowledge economy. A third component of South Korea’s approach to education is study abroad. No other nation in the world sends as many students overseas for study, and considered on a per capita basis Korea’s lead is near insurmountable. A fourth contribution of education to Korea’s information revolution was in creation of citizen awareness and demand. The massive three-decades long government, media, citizen and private sector campaign to promote the information society and raise public awareness of information culture, is itself one large educational undertaking. Today citizen awareness of the information society and its significance is probably higher in South Korea than in any other nation on earth. In creation of citizen awareness and demand, Korea has set an example that many other nations might follow. A final dimension of education’s contribution to the information revolution in Korea is its integral role in research and development. University-based researchers and university-affiliated research institutes are important sources of basic and fundamental research relating to new media and ICT. The education sector’s support for R&D thus makes it inseparable from the second major factor in South Korea’s transformation, the development of indigenous technology capability.

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**ICT Innovation and R&D**

Faced with continual rapid changes in information and communication technologies, South Korea was able to develop its own technology production capabilities. The nation’s research and development efforts, beginning in the 1980s were focused on achieving an indigenous technological capability, initially in electronic switching systems and semiconductors. Those projects achieved rather spectacular success and became major drivers of the digital revolution in Korea. In other words, in the hands of well-educated people the new and more powerful technologies of computing and communications are what account for the epoch-making character of the information revolution.

Over the 30 years covered by this study, Korea’s model for technological innovation changed in important ways. In the 1980s the state and its lead research institute, ETRI, exerted strong, top-down leadership, with revolutionary results in the landmark TDX project. Over the ensuing decades, the private sector, not only in Korea but globally became more influential in funding and guiding telecoms R&D, and so the whole enterprise became more decentralized. Far from retreating to the sidelines, the government assumed a role that we have likened to that of an orchestra conductor.

**Government Policies**

A third major factor in South Korea’s digital development is government leadership. More frequently than any other country, Korea is held up as an example of government-led ICT development. In Korea, it was the government itself that initiated privatization and introduction of competition into the telecommunications market. Government leadership can be seen in each of the four policy balances that come into play in the strategic restructuring of the telecommunications and information sector in Korea.

First, the role of the private sector relative to that of the government increased greatly over the past three decades. However, the government maintained a critical role as an orchestra-leader, through the revolutionary changes in broadband internet and mobile telecommunications in the 1990s and into the ubiquitous era of the 21st century.

We have documented these changes in two main ways. The first of these was the government-initiated privatization of telecommunications services, beginning with value added services, then specific services and finally general service providers, epitomized by Korea Telecom.

The other way in which we have shown the growing influence of the private sector is by documenting the spectacular growth of Korea’s *chaebol* conglomerates, with special emphasis on the largest of them. Samsung Electronics illustrates the sort of impact that a single large company can have. Cumulatively the *chaebol* have had an immense impact on ICT diffusion and Korea’s economic growth.
Studies by the ITU, the World Bank and other international organizations have all noted the apparently smooth cooperation between government and industry in Korea. Our interpretation is that this cooperation came largely because the government and business circles shared a common interest. The need for the government to privatize telecommunications and separate itself from the industry was recognized early in the 1980s, yet it could not easily do this. The closer government came to business circles, the more there was friction or criticism coming from the business community. Yet leaders from both government and industry acknowledged during the 1980s that telecommunications development required a broadly cooperative effort. Only through such cooperation was the revolutionary progress of that decade made possible.

Another important aspect of Korean government leadership had to do with financing. The South Korean government and private sector invested very large sums of money into the construction of the nation’s information superhighways, between 1995 and 2005, and more recently the nationwide build out of wireless broadband (WiBro). In addition, the 1980s experience of building the PSTN, a project completed in June of 1987, involved systematic reinvestment of a percentage (3%) of profits over a period of years into research and development, a percentage that was not reduced until 2002. Traditionally, spectrum auctions and licenses have been very lucrative for governments, and the funds generated are absorbed in the government’s general budget for funding any projects as the government sees fit. In contrast, the Korean government recognized that, as a way to help Korea become a world leader in ICTs, these funds could be strategically reinvested in the telecommunications sector.\footnote{Forge, Simon and Erik Bohlin. “Managed Innovation in Korea in telecommunications – Moving towards 4G mobile at a national level,” Telematics and Information 25 (2008), p. 304.}

As the ITU Broadband Korea study put it, the private sector has done most of the “heavy lifting” in helping to achieve Korea’s current status as a world leader in ICT. Nevertheless the role of the government as the leader in Korean ICT development should not be overlooked. It is part of Korea’s business culture to listen to the government.\footnote{Kelly, Tim, Vanessa Gray and Michael Minges Broadband Korea: Internet Case Study, International Telecommunications Union, March, 2003, p. 54.}

The Korean experience underscores the reality that modern digital networks are large and costly construction projects. Part of the reason for this nation’s success is that it invested significantly and over a long period of time in building the required infrastructure. As the experience of the United States and other countries in recent decades indicates, if private telecommunications companies are left alone, they may or may not invest adequately in a national infrastructure.

On the second policy balance of monopoly versus competition there was major change over the decades treated in this book. As the decade of the 1980s dawned, telecommunications in Korea was a government monopoly under the
Ministry of Communications, as in many other developing countries at the time. That policy balance shifted dramatically toward competition in the ensuing decades, particularly as the government encouraged facilities-based competition. As the World Bank study noted “The key feature that distinguishes Korea’s deregulation and competition policy in the telecommunications services sector from other countries was its reliance on facility-based competition.”

Such competition results when new entrants into the sector build their own facilities to provide services, as opposed to service-based competition, where the entrant uses the facilities of the incumbent. Korea is one of the few countries that has multiple operators in all markets within the telecommunications services sector.

Korea pursued a policy of gradual introduction of competition in basic telecommunications services. Once again, the strategy took into account the category of service. The provision of value-added services was opened up for competition in 1990. In 1996 three PCS licenses were granted to new competitors in the provision of mobile communications services. Competition in international calls began in 1991, long distance in 1995 and local call service in 1999.

In the case of both broadband internet and mobile communications, the Korean government orchestrated the players, rather than letting the pure market oligarchy of large chaebol groups rule. It attempted to level the playing field for competition, but at prices for affordability to assure public acceptance. The Korean government also showed a flexibility and willingness to change the road map as it unfolded in response to supply and demand.

On the third major policy balance, foreign versus domestic ownership, there was also considerable change over time. Restrictions on foreign ownership of telecommunications service providers began to be gradually lifted during the 1980s, most rapidly in the category of value-added services.

In the 1990s and beyond, private companies like Samsung Electronics and LG Electronics, along with Korea’s service providers, SK Telecom, KT and LG Telecom, came to play an increasing role in the ICT sector. The challenges posed by technology change and convergence have pushed all of these companies toward joint ventures with U.S., Japanese, European and other international companies. Along with other of the OECD economies, South Korea has experienced an overall growth of foreign ownership and investment in the ICT Sector.

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Our treatment of the foreign versus domestic policy dimension in this book also dealt with the influence of bilateral trade talks with the U.S., the Uruguay Round multilateral talks and the WTO negotiations. These clearly exerted a growing influence on South Korea’s ICT sector as it was drawn into the new increasingly global information age economy.

Finally, on the question of centralized versus decentralized telecommunications policy our analysis suggests that Korea’s approach became progressively more decentralized over the three decades covered by our study. One important aspect of this trend toward decentralization was the government’s own effort to liberalize the telecommunications sector, in order that it could develop more fully in line with global trends.

A second important element in decentralization, as discussed in Chapter 3, was the steadily growing influence of the private sector and along with it, an increase in the number of actors capable of influencing policy. Shortly after the turn of the century, it became evident that the old top down policymaking that had characterized Korea’s developmental state in the 1960s and 1970s would no longer work. Accordingly, the government moved to incorporate ICT sector-wide approaches that brought in more actors.

In retrospect, Korea had started important work to smooth decentralization back in the 1980s. A third factor in the trend toward decentralization was the steady attention of government and the private sector to citizen awareness or the demand side of ICT, economically speaking. The development of information and communication technology is not just a matter of building the hardware and programming the software. To be economically viable there must be sufficient consumer demand for the products and services.

As a recent report by the Information Technology and Innovation Foundation on Explaining International Broadband Leadership notes, “Demand-side policies matter.” It cites South Korea’s Agency for Digital Opportunity and Promotion (KADO), the sole mission of which is to promote digital literacy, access to computers, including training programs to let people buy computers through low-cost installment programs.\(^5\)

On balance, the broad government, private sector, media and citizens groups campaigns for citizen awareness of information culture have made Koreans among the most ICT-literate citizens in the world, and have had a decentralizing effect.

To this point, the main elements in South Korea’s digital development are ones that could be emulated by almost any other nation on earth. However, most

observers of Korea’s transformation would agree that there are other factors, more unique to South Korea itself that help to explain its success.

**Timing**

While we would stop well short of calling the communications revolution in Korea an “accident of history,” the timing of developments treated in this book must certainly be considered to fully explain them. For one thing, consider the utter devastation wrought by the Korean War. Many who are alive today can remember the hardships of the Korean War and its aftermath. Ironically, those desperate conditions may have helped instill a fierce determination to work for the nation’s development.

Another important aspect of the timing of Korea’s telecommunications revolution can be seen with respect to telecommunications law and policy in the United States, and the dramatic worldwide growth of the internet in the mid to late 1990s. In the United States, the Telecommunications Act of 1996, framed as a reform effort, was a major modification to the Communications Act of 1934. It was shaped during the early to mid 1990s and was enacted shortly after the 1995 commercialization of the internet backbone and the introduction of browsers that helped popularize the World Wide Web. Although many of the key actors behind this landmark legislation understood that sweeping change was on the horizon, “…full appreciation of the key role of the internet did not exist, in society or in Washington.”

In Korea, on the other hand, because of the timing of these developments in the United States the country “hit the road running,” so to speak by building the information superhighways necessary to exploit the benefits of the World Wide Web.

Another specific example of timing can be seen in the semiconductor industry. The global scope and the scale on which this industry operates produces periodic cycles of boom or bust that require long-range planning and investments of large amounts of capital. Korea began manufacturing semiconductors in the 1970s, following Lee Byung Chul’s famous public statement that he would stake the future of his Samsung group on semiconductor manufacturing. However, Korea had not made much of a dent in the semiconductor industry worldwide when a government-led consortium was formed in the 1980s to develop the manufacturing capability for the 4MB DRAM chip. This project was successful in no small part because the world markets were ready to buy Korea’s 4 MB DRAM chips in large quantities just after the technology had been successfully commercialized.

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**Political Liberalization and the End of the Cold War**

Digital development in Korea was also made possible by its political transformation, at home and in terms of its place within the community of nations. The domestic political changes and the international developments are inextricably related.

Domestically South Korea achieved democratization. Political liberalization in South Korea took a decisive turn in late June of 1987 as the government of President Chun Doo Hwan chose to accept virtually all opposition demands and called for elections later that year, in the interest of national harmony and the successful hosting of the Seoul Olympics. Also, as we have documented in this book, it was the government of President Chun that, early in the 1980s made the decision to liberalize South Korea’s telecommunications sector.

Internationally, the Seoul Olympics offered an ideal platform for President Roh Tae Woo’s “Northern Policy.” That policy basically involved the resumption of diplomatic, cultural and economic ties with the Soviet Union, Eastern European countries, China and Vietnam, all of which had been completely cut off during the long years of the cold war. Tragically, the highly successful northern policy failed to include North Korea, which boycotted the Seoul Olympics.

For evidence of the long term significance of Korea’s “Northern Policy” and the end of the cold war, one need only look at Korea’s current exports of mobile handsets, LCD displays and television sets to those former socialist-bloc nations with whom South Korea had virtually no ties. Indeed, trade with China alone underscores the success of the policy.

Both of these broad political transformations, democratization and the end of the cold war, bear a direct and profound relationship to the sort of information society that South Korea has built over the past three decades. Absent either of these changes, the remarkable developments described in this book would have stopped well short of fruition.

**Korean Culture and the Hangul Alphabet**

The Korean culture has proven to be very conducive to all forms of digital media and to the information revolution generally. The value that it ascribes to education helps to explain, as already described, how South Korea could rebuild its education system domestically following the devastation of the Korean War, send many students abroad for specialized training, and educate the public as to the importance of the “information society” over the past three decades.

In addition, the Confucian influence on Korean culture and its emphasis on one’s relationship to key groups in society have shaped its information culture. The rapid adoption of social networking via the internet in Korea makes this point as clearly as any other possible example. The social networking site, Cyworld, became wildly popular in Korea almost five years before such social networking sites as Facebook caught on in the United States.
Another example also illustrates the influence of Korea’s tightly-knit and homogenous culture on the diffusion of web services. Although it possesses the most advanced digital networks in the world, South Korea is also one of four countries that stand out from the global trend toward using Google to search the internet.

As described in Chapter 1, the creation of hangul, an indigenous alphabet is considered to be a crowning achievement of Korean culture. It not only contributed to mass literacy in Korea, but also accelerated the diffusion of computers, mobile phones and other electronic devices that require keyboard input. Moreover, because of its alphabetic and scientific character, it facilitated the development of a thriving graphics industry in South Korea.

“Over the Mountains are Mountains”: Geography and Demography

The 2002 ITU study, Broadband Korea, noted that South Korea was not demographically suited to have the highest internet penetration in Asia, being larger and more populous than the other Tigers, Singapore, Hong Kong and Taiwan. The report also noted that Korea had a lower per capita income than those other three “tigers.”

However, from another perspective Korea’s information revolution benefited from its mountainous geography. A well known Korean expression says that “after the mountains are mountains.” Indeed, on a clear day there are many vantage points when traveling throughout South Korea from which one can see a seemingly endless series of mountain ridges.

Korea’s mountainous terrain has historically interacted in powerful ways with Korean culture. While the nation had been devastated by war and possessed few natural resources, in a very real sense it was blessed by its mountains. As South Korea’s population grew, the logic of the mountainous geography almost dictated that most of the population would live in large cities rather than in the rural areas. This concentration of population in the cities and in the large high-rise apartments that house over half the population was a major factor behind the rapid construction of Korea’s information superhighways and the speedy uptake of broadband internet in South Korea.

In one other specific sense, Korea’s mountainous terrain facilitated the revolution in mobile communications. While mountains can block cellular and other mobile communications signals, they also provide high vantage points for mobile base stations. In this respect South Korea’s state-of-the-art mobile networks are like the beacon system that used fire and smoke signals for over 500 years during the Choson Dynasty (1392-1910).

570 Broadband Korea: Internet Case Study, ITU, March 2003, p. 2.
Korea’s Place in Cyberspace

To this point we have presented considerable evidence that the transformation of Korea over the past three decades was essentially a revolution in information and communications, made possible by the extraordinary efforts of the Korean people and their partners around the world. The magnitude of the changes in South Korea is now a well-documented matter of historical record.

However, those changes included the following characteristics that pose major challenges for Korea’s future development.

- It was based largely on manufacturing in the ICT sector, rather than services.
- It was strongly export-led.
- The large chaebol conglomerates played a leading role, versus small and medium sized enterprises.
- Korea’s domestic market lagged much of the world by more than two years in the widespread adoption of mobile broadband, as exemplified by the iPhone and Android phones.
- Korea was one of a small handful of nations around the world that did not quickly adopt Google for web search, relying instead on Naver, a far smaller Korean-language-only database.

The above features of Korea’s information revolution provide some important clues for thinking about its future, but they may not tell the whole story. After all, few people who experienced Korea in the 1970s or even 1980 would have imagined that the nation could develop as it has.

Whatever the challenges Korea faces, our study has documented the manner in which South Korea built its broadband networks several years before the other major industrialized countries of the world. Consequently, Koreans began to experience cyberspace and its effects some years before the rest of the world. These included more efficient and transparent government services and access to a broader range of educational information on one end of the spectrum. On the other end, South Korea confronted some internet addiction, problems with online gambling, computer viruses, hacking, and malware, to name some of the negative effects. In other words, by being one of the first nations in the world to build the information superhighways, Korea experienced not only the benefits but also many of the problems encountered in cyberspace.

The early arrival of broadband internet and the growth of cyberspace in Korea, on balance, suggests opportunities for Korea’s future role. In the following sections we look at some of these.

**Local and Global Governance of Cyberspace**

The growth and development of both fixed and mobile broadband in South Korea occurred so rapidly that the legal system could not keep up with it. This was the case despite an almost continual effort by relevant government ministries and the national assembly to reshape laws for the information age.
Other countries face the same situation, and indeed may benefit from learning about the challenges Korea encountered and how it dealt with them. The nation can share its success stories about building a world-leading system of e-government, as well as the efforts it has made to deal with the negative side effects of the internet.

Moreover, the challenge to the legal system affects not only Korea, but every country in the world. Different legal systems and systems of government react to the information revolution in different ways, but they all face the challenge.

South Korea has moved very rapidly from a period of government-led telecommunications development to a position at the leadership table in the shaping of the future internet and with it, cyberspace. Leading industry analysts and observers have begun to recognize this fact. Eli Noam, referring to the regular meetings of the world’s telecommunications industry, organized by the International Telecommunications Union (ITU), has argued that telecommunications leadership is changing guard. “On the network side, the US is not in the lead in wireless and broadband, the cornerstones of new communications. Even if things are not nearly as bad as some critics charge, since the international comparisons have apples-to-oranges problems, other countries are setting the pace, increasingly in Asia.” As if this were not enough, he went on to argue that “On the governmental and policy level, the US has ceased to be the place to find new policy directions. True, much of what is happening around the world has been inspired by FCC policies of five or more years ago, but the next generation of ideas is coming more from London, Seoul, and Brussels than from Washington or the federal states, which were often the laboratory for US policy innovations.” The remainder of his editorial went on to suggest that America was coasting on past glories and that change would need to come from the FCC in Washington. However, that organization had been politicized, while technology continued to change at the speed of Moore’s Law. The question he suggested is who will now set the tone, pace and business models for the vital infrastructure of the information age.

**Education**

Public education about the internet and cyberspace becomes a matter of increasing urgency with continued growth of digital networks. It is precisely in the area of education about the information society and information culture that Korea has been a world leader and has a great deal to share.

Within Korea as well as globally, better education is required at all levels from primary through tertiary and lifelong education. Only through such educational

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efforts can the negative aspects of the internet be controlled so that its positive contributions reach more people.

Recognizing the continuing educational challenge, both at home and globally, in July of 2009, three government agencies were consolidated into the Korea Internet and Security Agency (KISA). The old agencies included the Korea Information Security Agency, the National Internet Development Agency of Korea, and the Korea IT International Cooperation Agency.\footnote{http://www.nida.or.kr/kisa/eng/english_ver.html \<Accessed July 20, 2010>}

The Korea International Cooperation Agency (KOICA) remains one of the most important government organizations when it comes to international educational aid, especially for developing countries. KOICA supports a very active program of aid on the role of ICT in development.\footnote{http://www.koica.go.kr/english/aid/ict/index.html \<Accessed July 20, 2010>}

**Cyber Security**

In November of 1988 the young internet experienced its very first worm attack. At that time, there were only about sixty thousand computers attached to the internet and most of them were mainframes, minicomputers and professional workstations in government offices, universities or research centers. Within the span of one day, five to ten percent of all internet-connected computers were compromised by the worm.\footnote{Zittrain, Jonathan. The Future of the Internet and How to Stop It. New Haven: Yale University Press, 2008, p. 36.}

That first worm attack was successful because of the open structure of the internet and the fact that computers back then were unsecured. This is what Zittrain refers to as the generative character of the internet. He argues that it is now in jeopardy because of developments since 1988. Unlike then, there is now a business model for bad code, resulting in a massive increase in computer viruses, malware and botnets. Leading anti-virus companies have begun to publicly express doubts about whether they will be able to withstand the growing onslaught of computer viruses.\footnote{Zittrain, Jonathan. The Future of the Internet and How to Stop It. New Haven: Yale University Press, 2008, p. 46-47.}

Today many individuals and organizations are responding to the increase in viruses, malware and spam by turning to cloud computing and the use of such electronic appliances as the Apple iPhone. The underlying question is whether this response will ultimately forestall internet failures caused by bad code.\footnote{Zittrain, Jonathan. The Future of the Internet and How to Stop It. New Haven: Yale University Press, 2008, p. 101.}

Over the years, Korea has had its fair share of experience with viruses, worms, malware and botnets. The July 4, 2009 simultaneous cyber attacks on web sites
in the United States and South Korea was a sharp reminder of the increasing challenge posed by the threat of cyber warfare.

There is growing international consensus about the need for public discussion of cyber security. Today, there is still little agreement in cyber security circles about what cyber warfare actually means. It could involve anything from surreptitiously infiltrating adversarial computers to siphon intelligence, to full-on cyber assaults against a power grid or air-traffic control network. On the other hand, it might also involve planting disinformation, manipulating the electronic results of an election or sabotaging financial markets through computer networks.\(^\text{578}\)

Korea’s future place in cyberspace will depend upon its ability, together with governments, corporations and citizens groups around the world, to successfully address these serious security threats. In July of 2010, Korea joined fourteen other nations in making a set of recommendations to the United Nations Secretary General for an international computer security treaty. The other nations were the United States, Belarus, Brazil, Britain, China, Estonia, France, Germany, India, Israel, Italy, Qatar, Russia, and South Africa. The recommendations represented the first step toward ending a decade-long impasse between the United States and Russia over how to deal with threats to the internet.\(^\text{579}\)

Without a secure internet, the healthy growth of cyberspace is jeopardized. A secure internet, in turn requires a viable form of international governance. This is precisely where South Korea can play a constructive role in the years ahead.

**Cyberspace and the Inflection Point**

At this book’s outset we noted the importance that other scholars and industry executives attribute to the current inflection point in the ICT sector. The growing importance of cyberspace to Korea and other countries can be more clearly understood as a consequence of the inflection point in the global ICT infrastructure.

The combination of increased modularity with the emergence of ubiquitous broadband communications greatly increases the potential scope of information-technology solutions. The current inflection point has two significant consequences. First, it significantly changes competitive opportunities in the ICT industry by lowering the cost of market entry and development costs and speeding up the pace of development. Second, it breaks ICT out of geographic and functional boxes, opening new frontiers for applications.


The advent of grid style computing and ultra broadband networks seems destined to revolutionize the conduct of basic research in science. In this context the next generation of networks will be essential to support the ambitious goals Korea has set for progress in the space industry, nanotechnology, biotechnology and other cutting-edge growth fields. In just a decade or so, massively interactive applications combining video, data and computing will support a range of new activities. These might include remote medical exams and aerodynamic design of objects using ‘community’ wind tunnels and high-end simulation facilities.\(^{580}\)

Perhaps the most significant aspect of the inflection point, for Korea, is its global scope. Many of the problems now facing humanity are not limited to one nation, but rather extend around the globe. They include energy, global warming, education, health care and a host of other issues. Virtual reality may provide a significant means for human beings to ameliorate some of their most urgent problems. To date, it has been difficult to create a high fidelity virtual reality experience, largely due to technical limitations on processing power, image resolution and communication bandwidth. The inflection point means that those limitations should eventually disappear.

Looking ahead, the virtual reality of cyberspace promises to become steadily more important not only to Korea, to accomplish its national goals, but also to its partners around the world to cooperatively solve global problems. Korea’s Vision 2025, issued before the turn of the century, seemed to envision this future, as it called for a transition from a closed R&D system to a globally networked system.

**Cyber-space and Future Economic Growth**

Present and future economic transactions in cyberspace have implications for the real economy. As widely noted in tech blogs, many people in developing nations are earning a living creating goods to be bought and sold in virtual realities such as Cyworld and Second Life. The “acorns” that have become such a popular commodity on Cyworld appeared approximately four years before Second Life arrived in the U.S.

It is no great leap to imagine the virtual reality of cyberspace enhancing health care, business and the environment across a broad range of activities. Take for example, the new phenomenon of health tourism, popular in some Southeast Asian destinations such as Thailand and recently introduced in Korea. Using a social networking/medical care sort of web portal, such health tourism visits to Korea for needed surgery or care could be greatly enhanced. Not only could medical records be handled electronically, but remote consultations with doctors and hospital staff could take place prior to the patient’s actual visit to Korea. Likewise, a cyber community could assist greatly with follow-up and long-term care.

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In January of 2009 the South Korean government announced that it would try to focus the nation’s efforts on seventeen growth engines. These new national growth engines included six projects in green technology industries, including new renewable energies, low-carbon energies, LED (light-emitting diode) applications, and green transportation systems; six in state-of-the-art fusion, or convergence industries, such as IT fusion systems, robot applications, and biomedicines; and five in high valued-added industries, including global healthcare, global education services, green financing, and MICE (meetings, incentives, conventions, and events) and the tourism industry.581

In all of South Korea’s future growth areas there will inevitably be a vast expansion of the nation’s presence in cyberspace. In the future era of ubiquitous networking and computing, it seems certain that cyberspace will become even more important relative to the real world.

**The Languages of Cyberspace**

The era is coming when well made software and well-established venture companies will raise a country’s GNP. It seems we are approaching an era in which all countries will be fighting for territory and position in cyberspace. Will Korea be able to meet this challenge appropriately?

As we have documented in this book, South Korea has constructed the necessary hardware and infrastructure. However, it continues to lag behind in software and development of what we might call the information mind. A significant part of this problem involves language.

Computer and internet literacy is one part of the linguistic challenge. At the stage when Korea was approaching 10 million internet users and 20 million hand phones there was a delay in developing the capacity to use information. Until that point about half of South Korea’s citizens were completely unable to deal with computers and could be classified as computer illiterate and internet illiterate. At that time the only practical use of computers for many people was simple web forms or playing games.

A second part of the language challenge has to do with the use of Korean versus English, Chinese or other languages of the internet. While it is natural that Koreans are most comfortable surfing the internet using their native language and alphabet, it is equally apparent that new applications, services and software must be developed in English and other dominant languages of the internet in order to succeed in the global marketplace.

In certain parts of cyberspace, South Korea has already established a strong presence. In the future, what will be the salient features of Korea’s place in cyberspace?

We have addressed some of the answers above. Several things seem certain.

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• The information and communications revolution that transformed South Korea is continuing apace.
• Education, innovation and technology change not only drive South Korea’s economy but link it inextricably to nations all over the world.
• Korea’s future information society will be increasingly multicultural, multilingual and global.
• Korea’s place in cyberspace will depend far more on innovative software, applications and content than upon manufacturing of hardware for the underlying networks.

It appears that Korea’s leadership in shaping the global information society will ultimately be most profoundly exerted in cyberspace. This seems like the appropriate space in which to envisage a society in which information flows freely among the many cultures of the world, yet with respect for diverse cultural traditions.

In the future global information society, the clear challenge for Korea will be to transform itself from a monolingual, relatively homogeneous culture into a multilingual, multicultural, and more outward-looking nation. At this stage, early in the 21st century, there are signs that the nation is on such a path.

The Geography of Cyberspace

In the real world, South Korea occupies a certain amount of physical space, about the size of the U.S. state of Indiana. However, it might soon occupy significantly more “space” in cyberspace than in the real world. After all, it built the digital networks that make cyberspace possible and did so earlier than most other countries. It also began homesteading in the frontier of cyberspace through Cyworld and other social networking sites, and by way of the massive multiplayer online games that became so popular as a professional sport in South Korea. These are clearly promising developments.

The geographical contours of a nation in cyberspace bear an interesting relationship to the real world. Take for example, the controversy which erupted again in 2008 about the sovereignty over Dokdo. In cyberspace, at least, it is abundantly clear that Dokdo is part of Korea and not Japan.

This controversy flared up when the Japanese government publicly announced that it would begin teaching its middle school students that Dokdo (called Takeshima in Japan) was historically Japanese territory. With good reason, this sparked controversy, in the mainstream press and on the internet. In fact, the entire episode took place largely through electronic media.

In many respects the dispute that flared up between Korea and Japan was more of a cyber-dispute than an actual real-world confrontation, even though the two are obviously related. The government of South Korea and other groups took this opportunity to enhance some excellent websites in multiple languages explaining Korean history as it relates to sovereignty over Dokdo. These remain available for anyone wishing to learn more about this issue.
The Voluntary Agency Network of Korea (VANK) played an active role in the Dokdo dispute. Established in 1999, the organization refers to its members as “cyber diplomats.” Their web site is published in Korean, English and ten other major languages.\textsuperscript{582}

Not surprisingly, there was relatively little internet activity to support the Japanese point of view on this issue, probably for absolute lack of historical data to support it. A perusal of press coverage of the issue indicates that most Japanese claims to the rocky islets date from around 1905, which of course is when Japan annexed Korea.

Nevertheless, the whole Dokdo issue is thought provoking in the following sense. It involved a Japanese claim about certain Korean territory in the real world. If we look to the emerging realm of cyberspace, what sort of spatial presence does Japan have versus Korea?

In the Korean conception of cyberspace, whether Yi-ee Do or Arirang going over the mountain ridge, there can certainly be no division of the nation, and no divided families. In cyber space, as distinct from real space, there is much more to unite the nation than to divide it. Everyone speaks the same language and shares a common history. From the vantage point of cyberspace, Korea’s national division can be seen clearly for what it was, a tragic aberration caused by world politics in an older, outmoded era. Some parts of cyberspace may also play an important role in maintaining contact with and a sense of cultural unity with the over 6 million overseas Koreans around the world.

We might also speculate with some certainty that there will be mountains in cyberspace. These mountains, like those that cover the Korean peninsula, symbolically represent the challenge that faces the nations of the world to build an information society. Korea’s place in that information society will be shaped, as in the past, by the mountains and by the vision of cyberspace presented in the treasured Arirang myth. Based on the record of the past three decades, Korea’s place in cyberspace will be a prominent and proper one.

\textsuperscript{582} \url{http://prkorea.com/english/etc/about1.htm}