KNOWLEDGE SHARING PROGRAM

2010 Modularization of Korea's Development Experience: IT Promotion

2011

MINISTRY OF STRATEGY AND FINANCE

KDI Korea Development Institute

2010 Modularization of Korea's Development Experience: IT Promotion

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Project Title	2010 Modularization of Korea's Development Experience: IT Promotion
Prepared by	Korea Development Institute (KDI)
Supported by	Ministry of Strategy and Finance (MOSF), Republic of Korea
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English Editor	Kwang Sung Kim, Freelance Editor

Government Publications Registration Number 11-1051000-000149-01

ISBN 978-89-8063-577-1 94320

ISBN 978-89-8063-573-3(SET 10)

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Government Publications Registration Number
11-1051000-000149-01

Knowledge Sharing Program

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Preface

In the 21st century, knowledge is one of the key determinants of a country's socio-economic development. In recognition of this fact, the Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI) launched Knowledge Sharing Program (KSP) in 2004. The KSP aims to share Korea's development experience and knowledge to assist socio-economic development of partner countries.

The KSP is comprised of three parts: 1) the systemization and modularization of Korea's development experiences into case studies, 2) policy consultation through knowledge sharing with partner countries, and 3) joint consulting with international organizations. The systemization and modularization of Korea's development experience researches and documents Korea's successful policy experiences, such as the 'Five-Year Economic Development Plan' and 'Saemaul Undong (New Village Movement).' The policy topics are 'systemized' in terms of the background, implementation and outcome, and then, presented as case studies in order to achieve a complete understanding of the actual policies. These systemized policy case studies are further 'modularized' by sector so they can be utilized as concrete examples by partner countries to meet their interests in specific institutions, organizations or projects. For example, Korea's 'Export Promotion Policy' has been prepared as a systemized case study while 'the Establishment of the Export-Import Bank' has been modularized to provide a specific example of Korea's export promotion experience in export financing. The modularization of Korea's development experience traces back to a policy's inception and recapitulates the rationale for its introduction; its main content; and its implementation mechanism. The case studies also evaluate a policy's outcome and draw insights with a global comparative perspective. These case studies include literature reviews, surveys and in-depth interviews with the policy practitioners and experts who participated in the implementation process.

The systemization of Korea's development experience was initiated in 2007 and finished in 2009. Under the new Modularization Project, launched in 2010, the plan has been set out to modularize 100 case studies by sectors and topics in three years.

I would like to take this opportunity to express my sincere gratitude to Project Manager, Dr. Wonhyuk Lim, and all the Korean experts for their immense efforts in successfully completing the '2010 Modularization of Korea's Development Experience.' I am also grateful to Managing Director, Dr. Kwang-Eon Sul, and Program Officer, Ms. Ja-Kyung Hong, the members of the Center for International Development, KDI, for their hard work and dedication to this Program.

I earnestly hope that the final research results will be fully utilized in assisting the development partner countries in the near future.

Oh-Seok Hyun
President
Korea Development Institute

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2010 Modularization of Korea's Development Experience:
IT Promotion

Chapter 01

Internet Education for All

1. Introduction
2. Background and Objectives of the Government's Policy
3. Details of Internet Education for All
4. Outcomes of Internet Education for All
5. Implications

Chapter 01

Internet Education for All

Sangwon Ko (KISDI)

<Summary>

As Korea continued to transform into a knowledge-based economy where information and knowledge are the key sources of economic growth, the Korean government had been pushing for informatization in a variety of efforts since the mid-1980s. However, Korea still remained a low achiever of informatization among the OECD countries even in the mid-and-late 1990s while other major countries were stepping up their informatization drives. The use of the Internet and PCs was still limited to certain groups of people, further widening the digital divide. With the economic growth rate falling and the unemployment rate rising, in the wake of the Asian currency crisis in the late 1990s, there was a rising need to boost productivity and demand through the informatization of the public. Under such circumstances, the earlier-than-scheduled completion of the second phase of the broadband network construction laid the foundation for increasing the use of broadband network and revitalizing Internet services. This enabled the Korean government to set policies for carrying out Internet education for all Koreans, as a way to improve quality of life, tackling the digital divide and galvanizing the economy as a whole.

In doing so, the government set up an informatization promotion fund as the funding mechanism for the informatization initiative. To facilitate the execution of the initiative, the government assigned different roles and functions to different government organizations: Consultative bodies such as the Informatization Promotion Committee, executive committee and subcommittees took charge of related review and assessment; the Ministry of Information and Communication was responsible for consolidating and modifying individual plans; and each branch of the government took charge of setting and executing area-specific plans. With

this organizational structure set in place, the national informatization education was commenced in 1999. Major implementation plans included the operation of informatization training centers, instructor group assistance programs and online education to improve access to education by the information-underprivileged, and diffusion of PCs to increase Internet access. Certification systems were introduced to increase the value of informatization education, and mass media and standard training materials were used to raise the awareness of informatization among the public. To provide more specialized education for each target group, different government ministries were assigned to different target groups.

Specific plans concerning Internet education for all Koreans included the Comprehensive Digital Literacy Plan established in 1999, the Digital Literacy Plan for 10 Million established in June 2000 following the Cabinet meeting and the Phase 2 Digital Literacy Plan developed in 2002. The Comprehensive Digital Literacy Plan did not result in raising the public's ability to use information to satisfactory levels. Moreover, there was a serious gap in the ability to use information between different social classes. While public officials, teachers, students and office workers had basic skills to use information, farmers, housewives, people with disabilities and the self-employed significantly lacked the skills. As such, 10 government ministries came up with a follow-up initiative called the Digital Literacy Plan for 10 Million. Not only did the initiative achieve its goal earlier than scheduled, but it also created a phenomenal growth in Internet expansion and use. However, as the quality use of the Internet was still not sufficient, the government formulated the Phase 2 Digital Literacy Plan July 2002-2004 in July 2002 in order to promote practical use of information in real life and business and turn all Koreans into creative human resources who are both consumers and producers (i.e. prosumers) of information.

The series of coordinated, government-wide digital literacy policies carried out since 1999 not only resulted in building the world's most advanced high-speed information infrastructure in Korea, but utilization of information technologies in real life - time spent per person to use the Internet, online stock trading or online banking, for instance- greatly improved also. By 2005, when the initiative was completed, Korea ranked high in informatization among the OECD countries. Korea's ranking in the category was low in 1999 when nationwide informatization was nonexistent. Other positive effects on the economy were also generated, including improved individual productivity and increased demand for ICTs. Informatization also gave rise to positive effects on society, culture, politics as well as quality of life of individuals.

Policy directions that played a decisive role in successfully digitizing all Koreans are as follows: When ICT devices are first introduced, an 'access divide' exists between those who can access the devices and those who can not. Then, when ICT devices are used by more people, a 'usage divide' can emerge between those who know how to use the devices and those who don't. As such, Korea's informatization policies were specifically targeted at expanding

universal access and utilization of information. For a successful execution of policies related to nationwide Internet education, therefore, it seems important that policy goals should be set for ensuring access to information products and services and raising skills to use information.

1. Introduction

Information technologies centered around the Internet increasingly become wireless and intelligent, with a number of application services transforming our lifestyles. The Korean government, recognizing that it would soon become difficult for people to live without the active use of the Internet in all aspects of life, has taken a policy approach of promoting Internet education for all Koreans. Such governmental efforts to promote informatization across the country have played a significant role in achieving the highest broadband penetration in the world.

The Internet education for all Koreans also plays a decisive role in bridging the digital divide. The digital divide exists in many aspects. A gap in the context of access to information and the ability to utilize information is a good example. To close the gap in the ability to use information, the Korean government began to provide intensive informatization training for easier access to the Internet among the marginalized. The "Digital Literacy Plan for 10 Million" set in motion in 2000 and carried out through 2002 is believed to have contributed to bridging the digital divide and helping the public reap real benefits from the use of information.

This report is classified into five sections consisting of background of the government's policy; initiatives undertaken; manners in which the initiatives were carried out; outcomes; and implications. The background section explains how informatization initiatives came to be carried out in Korea and other countries. The initiatives section describes the Comprehensive Digital Literacy Plan for All, the Digital Literacy Plan for 10 million, the Phase 2 Digital Literacy Plan and the Digital Literacy Plan for teachers and public officials. The strategy section describes the organizational framework and financial resources established to support the policy, division of roles among government ministries, establishment of new facilities such as informatization training centers and creation of instructor assistance groups, introduction of information literacy certification systems and other detailed implementation measures. The outcomes section observes the results of the initiatives versus original targets and analyzes the effects of the policy on the economy, society and culture, as well as changes in the nation's global competitiveness concerning Internet availability. Finally, the implications section explores lessons learned from the execution of the policy, along with factors that need to be taken into account when advising other countries on policies related to Internet education.

2. Background and Objectives of the Government's Policy

2.1. Policy Background

2.1.1.Informatization and economic state of Korea

The Korean government has been pushing for informatization since the mid-1980s. The National Backbone Computer Network initiative launched in 1987 laid the foundation for facilitating informatization in Korea. The first phase of the national backbone computer network initiative that lasted from 1987 to 1991 focused on building databases for putting together such information as land registration and finance essential for the national operation. The second phase of the national backbone computer network initiative that lasted from 1992 to 1996 mainly concerned linking different information systems to enable sharing of administrative information. Basic information systems covering administration, finance, education, research and defense were linked. Along with these efforts, the government also strove to strengthen essential infrastructures for facilitating informatization and spreading information culture. It continued to distribute computers to elementary, middle and high schools to create an environment for informatization education. In addition, a variety of cultural events such as 'Month of Information Culture' had been arranged since 1988 to raise the public awareness of informatization. To keep up with the rapidly progressing informatization trends in the 1990s, the Korean government took more aggressive measures. Consequently, the Framework Act on Informatization Promotion was enacted in August 1995 to establish a legal basis for promoting informatization at the national level.

As a result of various informatization promotion efforts, the digital literacy in Korea has substantially improved since the late 1980s. According to global comparisons released by the National Computerization Agency, Korea's annual average rate of informatization growth between 1989 and 1996 was higher than that of other major developed countries. During the period, Hong Kong posted 15.9%, Europe 24.0%, and Japan 29.5% in informatization growth, while Korea recorded a much higher growth rate of 33.2%. However, in terms of absolute degree of informatization, Korea lagged far behind developed countries and even competing countries. In 1996, the absolute degree of informatization was 5,423 in the US, 3,390 in Europe, and 2,923 in Japan, which were far higher than Korea's 689.

Table 1-1 | Global Comparisons in the Degree of Informatization (1989~1996)

	1989	1996	1989~96 CAGR
Korea	86	689	33.2%
The US	762	5,423	29.0%
European Average	661	3,390	24.0%
Japan	417	1,039	29.5%
Singapore	685	3,390	24.1%
Hong Kong	710	2,069	15.9%

Note: 1) Based on the assumption that Korea's informatization level is 100
2) Information index is calculated as a simple average of indices of Information Facility, Information Utilization and Informatization Support indicators and index of each indicator

Source: National Computerization Agency (1998).

Korea particularly fell behind in the utilization of information. It was found that public officials had a very low level of skills of using information, and the share of the government's informatization budget in its total budget was small, resulting in a seriously low level of information usage in the public sector. Also, in industrial circles, except for some large corporations, companies did not creatively use information technologies. On the supply side, the supply of databases or software was greatly lacking, causing a delay in spreading the use of information.

Furthermore, other than certain groups such as professionals and students, the level of information usage and the environment that enables it were seriously weaker than other countries, thereby hampering the expansion of demand for informatization essential for advancing ICTs. A study on informatization conducted in 2000 found that farmers, fishermen, housewives and people with disabilities had relatively low levels of informatization across most of the indicators used, including usage rate of computers and Internet and rate of completion of informatization education, with the digital gap between these groups and students or public officials widening. Particularly, the lower the degree of informatization, the less people were inclined to receive informatization education, indicating that the digital divide between different social classes would likely continue to deepen. As such, the government needed to map out a new informatization plan targeting those that did not benefit from informatization.

Table 1-2 | Informatization Status by Social Class

(Amounts in %)

	Computer Usage		Internet Usage		Computer Training Completion		Plan to Receive Education in 2000
	May '99	Dec. '99	May '99	Dec. '99	May '99	Dec. '99	
Farmers/ fishermen	2.9	4.7	1.0	2.2	4.8	4.7	18.6
Housewives	10.9	28.0	1.8	9.2	19.1	31.8	62.8
The self-employed	23.6	36.8	5.9	18.4	20.0	25.3	51.3
The disabled	-	46.5	-	28.6	-	36.5	58.5
Junior high/High school students	66.6	88.3	21.7	65.7	70.3	79.5	77.5
Public officials	-	91.0	-	69.3	-	77.7	74.7
Teachers	-	96.0	-	74.9	-	87.7	72.4

Source: Yeom Jae-ho *et al.*(2002).

Due to the slow progress of informatization, the number of Internet users per 100 people in Korea was seven in 1998, placing it 20th among 31 OECD countries. Korea also ranked 20th among the OECD countries with only 18% of households owning computers in 1998.

Meanwhile, the economic growth rate in Korea sharply fell to -6.9% in 1998 following the Asian currency crisis that broke out at the end of 1997, and the unemployment rate rapidly rose to 7.0%. Sensing that the 21st century would be characterized by the rise of the information society, the Korean government predicted that informatization and advances in the ICT industry would become the driving force of the global economy. Accordingly, the government placed high priority on the ICT industry and informatization in its policy agenda to boost the nation's competitiveness. A number of policies were subsequently planned and executed. Informatization education for all Koreans was one of them.

Table 1-3 | Economic Growth and Unemployment Rate in Korea (1997~2000)

	1997	1998	1999	2000
Economic Growth Rate	4.7	-6.9	9.5	8.5
Unemployment Rate	2.6	7.0	6.3	4.1

Source: Bank of Korea, National Statistical Office.

2.1.2.Completion of broadband network construction

In the 1990s, developed countries were intent on building a broadband network essential for driving economic growth in the information era. In keeping up with such a trend and to become an ICT powerhouse, the Korean government also established a comprehensive plan to build the 'Korea Information Infrastructure' in 1994 under which the nation's broadband infrastructure would be deployed in three phases from 1995 to 2005.

The focus of the first phase (1995-1997) was on building a communications network. Fiber-optic cables were laid and pilot ATM switching networks were built in 80 regions across the nation. In the second phase (1998-2000) during which the goal was to complete construction of the communications network, commercial ATM networks were built and optical networks were constructed in all 144 calling areas nationwide. This project was originally scheduled to be completed by 2002 but was pulled forward by two years in order to secure core infrastructures needed to enhance the nation's competitiveness as quickly as possible. In all 144 regions, high-speed, large-volume fiber-optic cables and ATM switching networks were installed, and broadband infrastructures capable of delivering ATM-based high-quality Internet services were completed, expanding broadband access to cities, districts, boroughs, and even to lower-level

Table 1-4 | Comprehensive Plan for Korea Information Infrastructure

	Background	Project Plan (Duration)	Remark
Korea Information Infrastructure Master Plan (March 1995)	Build "Information Superhighway" until 2015	• 1st phase : 1995~1997 • 2nd phase: 1998~2002 • 3rd phase: 2003~2015	-
Information Infrastructure Advancement Plan (September 1997)	Move up the information network construction schedule by 5 years to keep abreast with the trends and technological progress in developed countries and to prepare for infinite competition in the highly-advanced information society in the 21st century	• 1st phase: Completed • 2nd phase: 1998~2002 • 3rd phase: 2003~2010	• Completed 1st phase of KII (Dec. 1997) • Developed KII 2nd phase plan (May 1998) • Completed 2nd phase of KII (Dec. 2002)
Korea Information Infrastructure Framework Plan (May 2001)	• KII using fiber-optic cables was completed nationwide in the end of 2000 • President announced the early completion of KII in January 2000 in his New Year's address	• 1st phase : Completed • 2nd phase: 1998~2000 • 3rd phase: 2001~2005	• Developed KII advancement plan (Jan. 2002) • With the completion of the 2nd phase earlier than scheduled, 3rd phase was launched for earlier completion

Source: National Computerization Agency (2005).

municipalities (Eup/Myeon/Dong). With the establishment of the national broadband network, some 10,000 elementary, middle and high schools across the nation were given free broadband connectivity of 256Kbps speed or higher at greatly discounted rates, which further facilitated digital education. With the completion of the second phase of the initiative, Internet services began to take off on a sound footing.

2.1.3. Informatization progress in other countries[1]

With the explosive growth of the Internet in the mid-1990s raising the issue of a digital divide, developed countries such as the US, Europe and Japan began to pay much attention to the disadvantaged groups of society.

- **The US and Canada**

Since the Clinton administration, the US has been implementing a number of policies aimed at reducing the digital divide along with the construction of a high-speed information infrastructure. Major policies sought to provide assistance in the construction of high-speed information infrastructure in rural areas, construction of community access centers, distribution of computers, assistance in initiatives that utilized applied information technologies, assistance in communication fees for rural residents, ensured access to information for people with disabilities and senior citizens, and provision of informatization education to the disadvantaged.

To begin with, the construction of high-speed information infrastructure in rural areas was supported by various laws. For example, the "Broadband Internet Access Act of 2001" was established to provide low-interest loans to service providers engaged in the high-speed information infrastructure initiative, and the "Community Telecommunication Planning Act of 2001" enabled the federal government to financially support projects undertaken by local governments or non-profit organizations in the construction of communications infrastructure. Major programs concerning the construction of community information centers include "Neighborhood Network Centers" led by the US Department of Housing and Urban Development. The program was launched in 1995 to support the construction of computer training centers in public rental housing complexes for the purpose of creating employment opportunities and improving the well-being of residents. As of December 2002, more than 1,000 centers were in operation.

Another program designed to support ICT utilization by the disadvantaged is called "Technology Opportunity Program, or TOP" led by the US Department of Commerce since

1. Korea Agency for Digital Opportunity and Promotion (2003) and Korea Agency for Digital Opportunity and Promotion (2004)

1994. The program supported innovative informatization projects aimed at improving education, health, public safety, community services and access to information and communications services using information technologies.

The US also provided telecom charge subsidies for low-income households, Internet access subsidies for health care institutions in rural areas, grants for farming villages and telecom service providers operating in low-profit areas, as well as Internet access subsidies for schools and libraries through the Universal Service Fund. The program, called "e-rate," helped consumers in vulnerable circumstances and schools and public libraries obtain access to communications services at 20 to 90% discounted rates.

Particularly, the US provided the most advanced assistance in ensuring access to information for people with disabilities and senior citizens. The Telecommunication Relay Service, or TRS, was launched in 1993 for people who were hard of hearing. The Telecommunications Law, amended in 1996, ensures access for people with disabilities to telecommunications products and services and regulates the design, development and manufacturing of telecommunications products and services. The Rehabilitation Act was amended in 1998 to require Federal agencies to provide equal access to people with disabilities that is comparable to the access available to others when they develop, procure, or use electronic and information technologies. Besides these programs, all states of the US operated a rehabilitation assistive technology support program to distribute information products to assist people with disabilities.

Finally, the US president suggested in his State of the Union Address in February 2000 installation of Community Technology Centers, or CTCs, to help vulnerable citizens improve skills to use information. Under the program, more than USD100 million was spent to set up over 1,000 CTCs in low-income cities and rural areas.

Canada's national information strategy is represented by "Connecting Canadians" created in 1999 to support the nation's informatization effort. Other programs were executed to bridge the digital divide by building a high-speed information infrastructure, establishing facilities with access to information, and promoting the use of information. Canada's major program designed to resolve the digital divide is called the "Community Access Program" launched in 1994. The program assisted community-based educational institutions, public libraries and civil organizations in setting up Internet access facilities. The federal government supported up to 50% of expenses needed to purchase IT equipment, access the Internet and receive technological support. More than 5,000 centers had been set up in rural and remote communities by 2002. In another program, "Computer for Schools," computers were collected and repaired by the government or private-sector firms and then distributed to schools and libraries for free. Besides these programs, the "Can Connect" program allowed local residents, senior citizens and younger Canadians to learn ICT-related skills.

Europe

The UK's policies to tackle the digital divide were pursued as part of the government's efforts to shape an e-government with the goal of promoting social inclusion of all citizens. The UK's effort to bridge the digital divide is marked by the initiative led by the Department of Trade and Industry to build UK online centers and computer training centers.

UK online centers provided Internet access to senior citizens, people with disabilities, jobless people and other vulnerable groups of society and also serve as a space for simple computer training and online learning when necessary. Thousands of various UK online centers were in operation within private organizations, universities and libraries. In addition, some 1,000 ICT learning centers were constructed for the disadvantaged to improve information skills. Other programs were also carried out, including a pilot program for promoting utilization of information technologies by low-income households and another program for the distribution of used PCs to schools.

Asia

Japan set the goal of overcoming the country's long-standing economic recession by building an advanced information society, undertaking the millennium project, and achieving "IT Japan for All" at the national level. Hong Kong announced its national informatization blueprint at the end of 1998 under the slogan "Digital 21" to overcome the sluggishness of science and technology that followed after its handover to China. Hong Kong also launched the "Cyber port" construction project that was comparable to Malaysia's MSC project in March 1999 to position Hong Kong as the world's information technology hub. On the other hand, Singapore focused on connecting homes, libraries and schools to "Singapore One" which was commercially launched one year ago. Singapore also announced "Infocomm 21 Masterplan" in March 2000, a three-year plan in which a total of SD25 million (or USD14.56 million) was set aside to improve Internet connectivity, provide free broadband access, develop online shopping malls, and provide free e-mail accounts and personal home pages to all citizens aged five years or older to make Singapore as one of the world's five most advanced IT nations.

2.2. Policy Objectives

Korea's public internet education is aimed at improving economic and social capabilities of all Koreans by creating an environment suitable for their informatization through the government-wide efforts such as education for people with disabilities, senior citizens and the illiterate, assistance for informatization instructors and assistance in the development and

distribution of education content, as well as through online education and assessment of the public's information literacy. The objectives of the policy can be elaborated on as follows:

First, the nationwide Internet education is primarily intended to raise the quality of life of Koreans by improving their computer skills. The Internet and information literacy brings us plenty of benefits on various aspects: on the economic side, Internet users can save costs by purchasing goods, travel tickets, or banking and insurance products on line; on the political side, they can participate in online polls to express their opinions or visit a political group's web site to participate in political activities on the Internet; on the educational side, they can not only take various educational programs to improve their ability but also entertain themselves by taking part in recreational and cultural activities provided via the Internet; and moreover, they can obtain the information on job openings and find better jobs by preparing with ICTs. Informatization also has an impact on how time is spent. The time used for traditional media - TV, radio, and newspaper - decreased while that for online media increased. Another finding was that more time was used to work from home than before. The findings indicate that policy measures should be focused on the application rather than on the acquisition of ICTs. In other words, the acquisition of ICTs should be the means, not the end in information education. Information education, if pursued under such an understanding, will be much more effective.

The policy focuses on improving the quality of living through a broader use of ICTs and leading the nation to grow into an information society on all fronts where ICTs become an integral part of Koreans' daily lives. Such an information society can be realized by solidifying the information base through solid information infrastructure and by enhancing the nation's sawareness of informatization through informatization training. As more of everyday life is increasingly becoming digitized, as seen in e-learning, e-commerce, and e-government, the low level of information competence among the information disadvantaged will likely limit their opportunities to secure a basic living standard and social participation.

Second, preventing social and cultural problems by raising the level of competence in information is another important goal of the informatization strategy. If computer usage skills greatly differ among different groups of people, it makes it difficult for the government to implement policies to boost productivity through the investment in informatization. The government's informatization effort would end up aggravating income disparities. Informatization education for the disadvantaged is therefore a requisite to ensure everyone benefits from the government's policy. In an information society where the importance of information cannot be emphasized enough, it is necessary to minimize social conflicts and incongruity and ensure social stability by closing the divide between social classes.

The digital divide in an information society might not just remain as an ICT-induced

knowledge and information issue. It can lead to wider economic disparities putting the information-underprivileged at a disadvantage, which may make them feel excluded, insecure, and dissatisfied. Ultimately, this problem can become another source of social conflict. Hence, the digital divide should not be left unchecked as an inevitable byproduct of an information society; rather, appropriate policy measures must be taken to identify and support individuals or groups structurally isolated or excluded in the process of informatization, ensuring that the benefits of informatization are shared by all. It should be noted that just as the potential of the information society is realized in the process of producing, distributing and consuming information, the downsides of an information society can emerge in the same process. Given that in the information society the social welfare means, in a sense, the information welfare, promoting the information welfare for all can minimize social conflicts due to the digital divide, as such reducing social costs.

The third and final goal of nationwide informatization is to revitalize the economy by enhancing the public's informatization level. Informatization can be a driving force of economic growth by nurturing high value-added information industries and improving efficiency and transparency throughout society. National informatization can especially bring people closer to the information society by facilitating the use of information in daily life and greatly contribute to the growth of the domestic IT industry by boosting productivity and new demand for information and technologies. The growing base of competent producers and consumers of information will ultimately create a virtuous cycle that further expands the size of information-intensive market.

In its "Digital Economy 2000" report issued in June 2000, the US government noted that advancements in the Internet and ICTs were an important driving force behind the economic boom that the US enjoyed for some 10 years during the 1990s. According to the report, from 1995 to 1999, the share of the ICT sector in the US economy was only 8 percent, but the sector contributed to a third of the country's real economic growth. Moreover, price decreases within the ICT sector led to reduced prices by 0.5%p every year, while improved productivity lowered inflationary pressure in other sectors. Employment growth was also boosted by the ICT sector, with ICT-related jobs growing 30 percent from 4 million to 5.2 million between 1994 and 1998. In particular, improved productivity in the ICT sector boosted productivity of the US economy as a whole: the average annual growth rate of the US economy between 1995 and 1999 was 2.8 percent, higher than the 1.4 percent average annual growth rate recorded between 1973 and 1995. Judging that the ICT sector was leading the country's New Economy through productivity enhancement, the US government took more aggressive measures aimed at resolving the digital divide, securing human resources with advanced technical skills and reducing the trade deficit to achieve a sustained growth of its ICT sector.

As for Korea, according to Hong Dong-pyo et al. (2003), IT capital stock grew from 22.6%

between 1990 and 1995 to 26.5% between 1995 and 2000, making the share of IT capital stock in the nation's economic growth rise from 3.3% in the period of 1990-1995 to 9.5% in the period of 1995-2000.

Table 1-5 | Rate of Contribution of IT Capital Stock to Economic Growth in Korea

(Amounts in %)

	1990~1995	1995~2000
Rate of contribution to economic growth		
GDP	7.450	5.310
Contribution of labor input	1.193	– 0.004
Contribution of capital input	2.193	2.344
(Contribution of IT capital)	0.249	0.504
(Contribution of non-IT capital)	1.945	1.841
TFP growth	4.063	2.970
Share of contribution to economic growth		
GDP	100.0	100.0
Labor input	16.0	– 0.1
Capital input	29.4	44.1
(IT capital)	3.3	9.5
(Non-IT capital)	26.1	34.7
TFP	54.5	55.9

Source: Hong Dong-pyo *et al.*(2003).

3. Details of Internet Education for All

3.1. Strategies of Internet Education for All

Major informatization plans mapped out by the government include the Comprehensive Digital Literacy Plan established in 1999, the Digital Literacy Plan for 10 Million established in June 2000 following the Cabinet meeting and the Phase 2 Digital Literacy Plan developed in 2002. The Comprehensive Digital Literacy Plan, developed based on the opinions gathered by the Ministry of Information and Communication from each government ministry, envisions making Korea as the 'world's most computer-literate country.' The plan was aimed at providing informatization education to 25 million Koreans, including public officials, teachers, military personnel, students, farmers and fishermen, housewives, the self-employed and people with disabilities by 2002. The plan did not result in raising the public's ability to use information to

the satisfactory level. Moreover, there was a serious gap in the ability to use information between social classes. While public officials, teachers, students and office workers had basic skills to use information, farmers, housewives, people with disabilities and the self-employed significantly lacked the skills.

This led to draw up the Digital Literacy Plan for 10 Million. Through the education initiative, led by ten government agencies including the Ministry of Information and Communication, approximately 13.8 million were educated for information literacy from 2000 to June 2002. Notably, education was offered to the information-underprivileged classes including the disabled, the elderly, housewives who had limited opportunities for information training for social and economic reasons and other social groups including students, public officials, and military personnel from whom far-reaching effects of informatization were expected.

Not only did the initiative achieve its goal earlier than scheduled, but it also created a phenomenal growth in Internet expansion and use. However, in terms of quality, the use of the Internet was still not sufficient.

As such, the government formulated the Phase 2 Digital Literacy Plan July 2002-2004 in July 2002 in order to promote practical use of information in real life and business and turn all Koreans into creative human resources who are both consumers and producers (i.e. prosumers) of information.

3.1.1. Background of internet education for all

The information user base has rapidly broadened in Korea with the number of Internet users explosively increasing from only 1.9 million in 1997 to over 31.6 million by the end 2004. This can be seen, among other things, as a result of the Korean government's aggressive attempt to provide informatization education in three phases between 1999 and 2004 to all Koreans who were information-underprivileged, including housewives, military personnel, senior citizens, people with disabilities and even detained youths and prisoners. Specific plans concerning Internet education for all Koreans included the Comprehensive Digital Literacy Plan established in 1999, the Digital Literacy Plan for 10 Million established in June 2000 following the Cabinet meeting and the Phase 2 Digital Literacy Plan developed in 2002.

These plans, developed as part of the nation's informatization effort, succeeded in diffusing use of Internet across the country.

To tackle the low level of informatization and overcome the economic crisis, the government outlined the "Cyber Korea 21" initiative as the second-round informatization

framework in March 1999. The initiative established a comprehensive and systematic direction for the informatization policy, shifting from implementing sector-and project-based plans to building information infrastructure, improving the nation's overall productivity, and creating jobs through new business. Along with this, new policy measures were introduced, reflecting rapid changes in the informatization environment: the explosive spread of the internet, changing operating systems to global standards, improving knowledge literacy of all the people, fostering new businesses, etc.

The focused areas of "Cyber Korea 21" included "Promotion of Korea to have the World's Best Computer Literacy' that contained smaller projects: conducting informatization training for all; introducing a computer literacy accreditation system; creating a PC-for-all environment; fostering Internet Plazas; and closing the digital divide. The initiative clearly stated a key project for the expansion of information training for the information-underprivileged including the disabled, full-time housewives, the unemployed, farmers and fishermen to keep them from falling behind in the information society. According to the project, training sites for the disabled were continuously set up at related associations for the disabled and provincial and municipal welfare centers. Moreover, information training centers were opened at 100 post offices by 2002. Information training for local residents including housewives and the self-employed was further reinforced through government-run computer classes for local residents and through programs offered by information and culture promotion centers. Also, support was provided for the development of information devices and software for the disabled, and the "Guidelines on the Guarantee of Information and Communications Access" was established to ease their difficulty of accessing and using information and communications services.

In retrospect, the dicision that the Korean government focused on boosting demand for informatization by bridging the digital divide in the long term, rather than setting a short-term goal of resolving the unemployment issue even in situations when the economic growth rate sharply fell and the unemployment rate rapidly rose is considered to be a good strategy.

The fourth-round of Informatization Strategy Conference, held in April 2000, came up with a comprehensive plan to narrow the digital divide encompassing various policy areas – building the foundations for information and communications, creating a friendly environment for information access, and improving information literacy – under the agenda of "Build a Knowledge and Information Powerhouse for All".

Informatization education for the information-underprivileged was implemented in a more systematic manner with the execution of the Digital Literacy Plan for 10 Million. Then in January 2001, the Act on Narrowing the Digital Divide was enacted to tackle the digital divide throughout Korean society in a more comprehensive and systematic manner. In September of the same year, 14 ministries including the Ministry of Information and Communication

established the Comprehensive Plan for Bridging the Digital Divide 2001-2005, which instituted cross-ministerial efforts to narrow the digital divide. Under the plan, 10 ministries, including the Ministry of Education and Human Resources Development, Ministry of Information and Communication and Ministry of Agriculture and Forestry, developed and implemented projects for narrowing the digital divide from 2001.

"e-Korea Vision 2006" laid out in 2002 was the third long-term vision for national informatization following the Informatization Promotion Initiative in 1996 and Cyber Korea 21 in 1999. With regard to equal digital opportunities, "e-Korea Vision 2006" deepened and widened the measures brought by the Cyber Korea 21 initiative, still upholding the same overall policy direction. It declared that informatization training should be expanded for the information-poor under the goal of making 90% of Koreans Internet-literate by 2006. Additionally, it stressed the importance of practical and in-depth training.

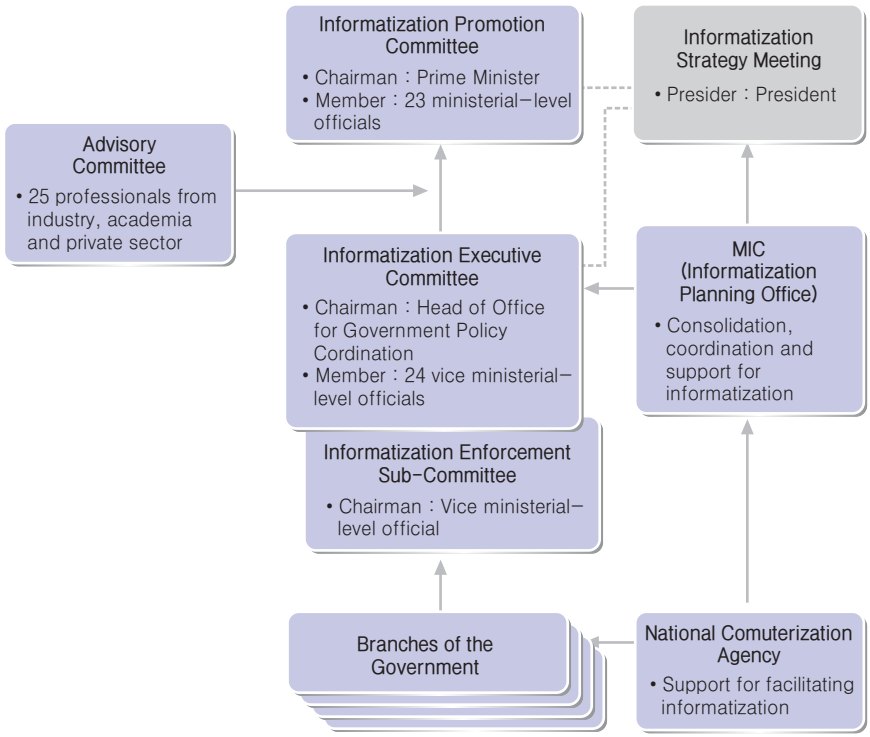
Moreover, in order to realize a ubiquitous Internet environment, the initiative planned to create a high-quality high-speed Internet-enabled environment all around the country and to extensively increase Internet access opportunities for the information-underprivileged and local residents. Compared to the second-round initiative, more emphasis was put on supporting SME informatization to close the digital divide between companies.

3.1.2. Organizational framework and resources in charge of internet education for all

The organizational framework in charge of promoting informatization in Korea is characterized by different roles and functions assumed by different government organizations: Consultative bodies such as the Informatization Promotion Committee, an executive committee and subcommittees took charge of related review and assessment; the Ministry of Information and Communication was responsible for consolidating and modifying individual plans; and each branch of the government took charge of setting area-specific plans, implementation plans and execution of plans.

Including the Informatization Strategy Meeting and a number of committees established under the Framework Act on Informatization Promotion, the Informatization Planning Office of the Ministry of Information and Communication, offices in charge of informatization initiatives in each government ministry, and the National Computerization Agency collaborated in coordinating, discussing, selecting and executing major policies concerning informatization. The Informatization Strategy Meeting presided over by the president, although not established under the Framework Act on Informatization Promotion, can be considered as an integral part of the organizational framework as it plays a role in coordinating informatization-related issues or inter-department issues based on discussions.

Figure 1-1 | Organizational Framework for Informatization in Korea



Source: Ministry of Information and Communication (2000).

In examining the organizational framework in charge of informatization in Korea, the Comprehensive Digital Literacy Plan was established in 1999 by the Ministry of Information and Communication based on opinions of each ministry and after a review by the 10th Informatization Promotion Committee.

Each government ministry was responsible for the task of developing target group-specific informatization education programs, while the Ministry of Information Communication focused on the development of general informatization education plans and support for programs undertaken by other ministries.

In 2000, the Digital Literacy Plan for 10 Million was established under the instructions of then president Kim Dae-jung to enhance informatization education for some 10 million people

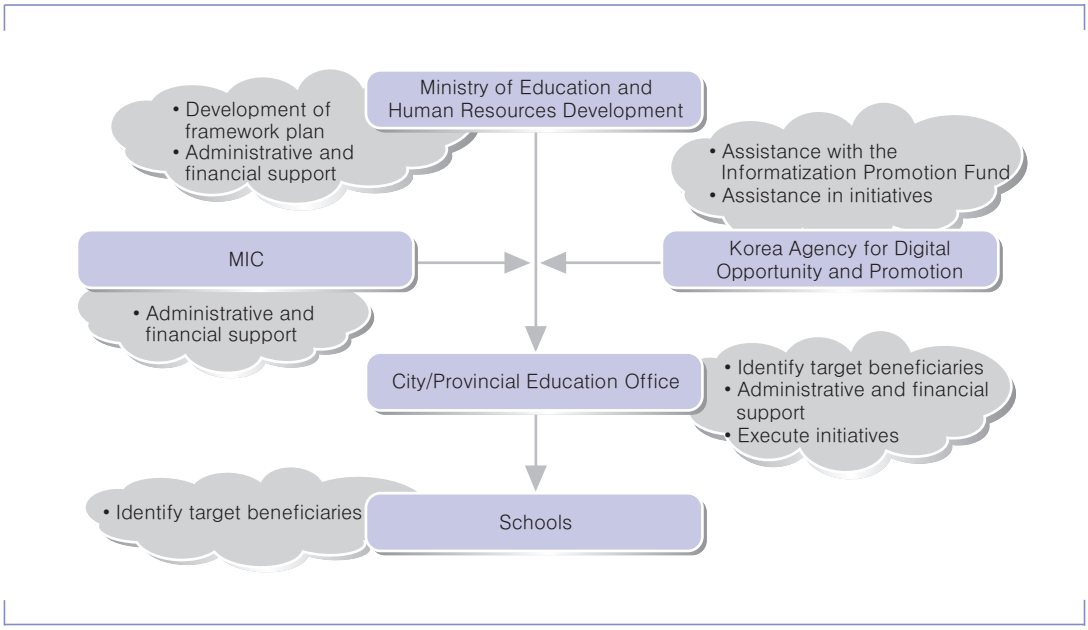
who were information-poor at the 4th Informatization Strategy Meeting held on April 6, 2000 to discuss strategies to narrow the widening digital divide. The Ministry of Information and Communication soon came up with the Digital Literacy Plan for 10 Million as part of follow-up measures to the Comprehensive Digital Literacy Plan based on opinions it collected from different government ministries. In implementing the Digital Literacy Plan for 10 Million, the Presidential Secretariat was in charge of providing necessary general oversight and coordination to ensure that each ministry works with different roles and that there is no overlapping investment. Each ministry in turn was responsible for establishing and executing target group-based education plan. The Informatization Enforcement Plan was developed annually by each ministry, which contained implementation plan for the informatization education. The Ministry of Information and Communication monitored and evaluated progress of the education carried out by each ministry and at the same time carried out publicity activities to promote public participation in the education. Lastly, the Phase 2 Digital Literacy Plan established in 2002 was the continuation of the Digital Literacy Plan for 10 Million and was carried out in the same way.

Financial resources for the nationwide Internet education were a pool of government funds and municipal expenses. The government funds were supported by the Informatization Promotion Fund. The Informatization Promotion Fund was set up by expanding the Information and Communication Promotion Fund (1993-1995) with contributions from telecom service providers. This was possible as Koreans in the 1990s had aspirations for being more proactive in informatization although they were late in industrialization. The Framework Act on Informatization Promotion was enacted to make it happen. The fund consisted of a general account and an R&D account, each designed to support investment in informatization and extension of related loans. When the major large-scale projects supported by the general account, such as construction of the information superhighway and the first phase of e-government construction were completed, the general account was abolished and the fund's name was changed again to the Information and Communication Promotion Fund to focus on IT R&D investments.

As for the framework to support the nationwide informatization effort, the Informatization Education and PC Distribution for Children in Low-income Households plan was developed in 2000 as part of the Digital Literacy Plan for 10 Million program. The plan was designed to provide basic computer training for 500,000 children selected from low-income households and provide PCs and Internet access free-of-charge for five years to children who are child heads of households, students in welfare facilities or students with good scores among those who received the education. As shown in Figure 1-2 below, while the basic education plan and administrative and financial support is provided by the Ministry of Education, the Ministry of Information and Communication is closely involved in facilitating collaboration among relevant ministries in administering and funding the program. Funding came from the Informatization

Promotion Fund and municipal expenses, with the Ministry of Information and Communication mainly using the former in executing informatization programs.

Figure 1-2 | Informatization Support Mechanism by the Ministry of Education for Children in Low-income Households (2000)



Source: Korea Agency for Digital Opportunity and Promotion(2003).

Table 1-6 | Funding of the Informatization Program of the Ministry of Education for Children in Low-income Households (2000)

(Amounts in KRW million)

	Informatization Education	PC Lease Expense	Communications Expense	Sub-Total
MIC Fund (Informatization Promotion Fund)	15,000	6,489	1,249	22,738
Program-specific share of expense (Municipal Expense)	12,379	0	1,240	36,357

Source: Korea Agency for Digital Opportunity and Promotion(2003).

3.1.3. Major implementation plans of nationwide internet education

- **Education by target group: Division of roles among ministries**

As explained earlier, each government ministry was responsible for developing and executing informatization education for target groups for which they were responsible. The Ministry of Information and Communication took part in the development of the general plan, providing necessary support for the development and execution of detailed plans of each ministry. As different groups had different educational needs, classification of the population based on jobs, age and other demographic properties was needed and it was therefore more efficient for different ministries to take care of different target groups to maximize educational efficiency.

By target group, the Ministry of Government Administration and Home Affairs was responsible for public officials and local residents; the Ministry of Education for teachers and students; the Ministry of Labor for the unemployed and the disabled; the Ministry of Commerce, Industry and Energy for company employees; the Ministry of Health and Welfare for the disadvantaged such as people with disabilities and senior citizens; the Ministry of Agriculture and Forestry for farmers; and the Ministry of National Defense for military personnel, respectively.

- **Improved access to informatization education**

> Informatization training centers and instructor groups

Informatization education close to people in need was carried out to provide them with more opportunities to access information. Informatization training centers and a pool of instructors were operated as part of such an effort.

"Informatization training centers" provided free informatization education to those living in rural areas, small and medium-sized cities and other regions where access to information facilities was poor. The Ministry of Information and Communication provided assistance in setting up and running training centers within post offices, and developing and distributing training materials. Training courses included Hangeul word-processing program, Internet and home page creation, and customized courses for group classes comprising senior citizens, public officials, company employees, etc. were also provided. Between 1999 and 2002, 100 training centers were set up in post office sites by the MIC and 16 additional training centers were set up by Korea Post.

"Informatization instructor group" program, created by the Korea Information Culture Center, has been in operation since 1998 to support informatization education for local residents

and people who had limited access to information. Welfare facilities, municipalities, public organizations, associations or schools that had basic information facilities but lack instructors were supported by the program. Instructors were made up of high-quality personnel such as university students or private company employees, and instructors were dispatched to sites at the request of private education centers. Instructors were basically volunteers and receive expenses needed for the training and meals (up to KRW 20,000 per day as of 2002).

> Online education

The Ministry of Information and Communication opened a comprehensive website for informatization education (Baeum Nara, www.estudy.or.kr) in September 2001 so that all Koreans, including the information-poor, can access informatization education at any time and anywhere. Nine study courses comprising IT basics, IT utilization, and group-specific courses for five subjects - computer basics, Internet basics, Hangeul 97, Excel and home page production- are available. In 2001, the first year of the operation of the website, 16,394 people received the online education. By June 2002, a total of 12 courses were available with the addition of Photoshop, PowerPoint and Internet Information Search Level 1 and Level 2 courses in the early 2002. Various online training courses offered by the Baeum Nara portal were tuition-free and available to anyone, and various systems were in place to make sure students get quality services. Each course had a fixed quota, and users could take courses immediately if they applied at the beginning of each month. Dedicated tutors managed study progress and answerred questions. Separate content was developed especially for people with disabilities in collaboration with the Shiloam Welfare Center for the Vision-Impaired and the Korea Association of the Deaf to cater to the actual requirements of learners. Content for hearing-impaired people provided sign language-based video clips and captions, while a separate website (blind.estudy.or.kr) for visually impaired people enabled learning using voice synthesizers.

- **Provision of tools: PCs and internet access**

Low price PCs were developed in collaboration with PC manufacturers for people who could not afford to buy PCs, and more "Public Access Points" were set up to provide free access to computers at public places such as post offices, Eup/Myeon/Dong offices and pubic libraries for people without computers. The government planned to install "Internet Plaza" at these locations so that users can freely use the Internet also. Internet Plazas were available in post offices. The government also facilitated the distribution of PCs and provided subsidies for Internet use for children in low-income households.

- **Certification system: National information competency certification system**

In 1999, each government ministry introduced computer literacy certification systems and

information literacy certification systems to objectively measure and assess the information literacy of students, public officials, teachers and the general public. In 2002, the Ministry of Education introduced the information literacy certification system, which required high schools to test the information literacy of students and record its result in the grade book so that universities could use it in their entrance screening starting 2002. Under the ministry's information literacy certification system, schools running information-related courses in their curriculum can give the certification to students who have taken the courses for at least 34 hours. The certification can also be obtained when students take related courses for at least 34 hours through after-school activities; when students obtain certificates by passing national qualifying exams; when students obtain various certificates issued by private institutions. In 1999, the first year of the system, 380,000 students or 53% of 710,000 first-year high school students obtained the certification. The Ministry of Education developed information literacy criteria and launched the information literacy assessment system in 2000. Prior to the introduction of the system, the ministry improved the extra point system in 1999 used by city and provincial governments when appointing candidates for public educational staff, and gave preferential treatment to those staff who possessed national certificates related to informatization.

The Ministry of Government Administration and Home Affairs also introduced the information literacy assessment system in 1999 in order to raise the awareness of informatization and information literacy among public officials.

● Raising awareness: Use of mass media and supply of standard training materials

Informatization education using broadcast media and new media that have big social impact was also enhanced. EBS and other cable TV channels were encouraged to produce and broadcast informatization education programs tailored to the different needs of target audiences and areas, and informatization-related special programs were produced to raise the awareness of informatization. In the meantime, standard training materials were developed to help the public gain knowledge needed to live in the information society and effectively receive informatization education. As part of the effort, 100,000 copies of four types of standard training materials introducing learners to basic knowledge in an easy language essential for an information society were produced until April 1999 and distributed to the public through government organizations, public organizations, schools and bookstores.

3.2. Details of Key Internet Education Plans

We will now examine details of Internet education provided by each government ministry to each target group.

3.2.1. The Comprehensive Digital Literacy Plan for All(1999)

3.2.1.1. Background and key points

The Ministry of Information and Communication outlined in 1999 the "Comprehensive Digital Literacy Plan for All" based on consultations with agencies concerned about broadening the computer literacy training program as one of the key projects of "CYBER KOREA 21", the grand initiative to build a creative, knowledge-based nation.

The government enlarged computer training facilities at public institutes - schools, military sites, and post offices - to allow citizens of all classes and disciplines to take computer training with ease, at the same time adequately preparing related institutions and systems to facilitate the execution of training. The plan aimed to educate approximately 25 million persons, 11 million from the public sector and 14 million from the private sector. Especially, educating students, public officials, and soldiers was stressed in the plan to reinforce the national competitiveness. The plan also proposed to continuously expand educational opportunities for the information-disadvantaged to ensure that no one would fall behind in the information society.

3.2.1.2. Focused areas by target group

- **Students of elementary, junior high, and high schools**

First, the plan recommended the schools of each level to re-organize computer-related subjects and expand computer training: conducting the training and an information literacy test to more than two million students every year, and encouraging schools to use the test results in the admission screening process.

Second, the plan mandated the installation of two computer labs per school of all levels (one lab in schools with less than 36 classes) and the establishment of internet-enabled computer networks on the school grounds.

Third, the plan supported the development and use of online training content as a way to widen educational opportunities and enhance learning effects. According to the plan, approximately four thousand varieties of content were to be developed and offered for 165 training modules. Moreover, an online life-long education center would be built and run under the plan.

- **Local residents (housewives and the self-employed)**

First, on-going computer training facilities of local governments should be enlarged (252 sites) to broaden information training for local residents. By region, schools of all levels were encouraged to open computer literacy classes to local residents utilizing their computer labs during idle times.

Second, on-going information training centers (100 sites) should be set up at post offices across the nation, and the information training for local residents had to be expanded through government-run computer classes and information and culture promotion centers.

Third, informatization training would be provided to 5,000 women including housewives every year through support of such training organized by women's organizations (women's hall, women's university, home for working women, etc.)

Fourth, free computer training programs run by private companies should be facilitated for the purpose of expanding training opportunities for local residents.

Fifth, in order to improve the quality of training for local residents, each of the 16 local governments (city/province) should run an instructor support group and offer related information and counseling services on digital literacy training through the informatization counseling center.

- **The disabled**

First, selected organizations for the disabled including the Korea Association of Disabled Person's Information would be supported with training equipment, materials, and instructors to execute informatization training for approximately 30,000 people with disabilities. Information training for the disabled should be expanded by encouraging regional welfare centers and other places where the disabled had easy access to set up related training facilities.

Second, by 2002, 15,000 disabled people should be trained through rehabilitation programs of community rehabilitation centers and the Korea Employment Agency for the Disabled in an attempt to link digital literacy training to vocational training.

Third, the development of training materials, software and aids by type of disability should be supported (e.g., windows software for the visually challenged, special keyboards for the physically challenged, etc.).

Fourth, volunteering for the disabled's information training and online remote training should be boosted .

- Public officials

First, the roles and responsibilities of training institutes for the government public officials should be defined in providing information training in order to differentiate and expand training courses by level of competence and area of business. The Government Computer Center reinforces training to the officials in charge of informatization, and central and regional training institutes for public officials conducted short-term professional training programs and policy education based on the nature of the trainee groups.

Second, information training for policy makers and manager-level officials of Grade 5 or above was to be strengthened. High-ranking officials of government agencies would be trained, and an informatization policy education program would be opened to policy-makers of local governments. Additionally, information policy education and computer literacy training would be provided to officials of Grade 5 or above of central and local governments.

Third, information training consigned to public and private educational institutions should be expanded. Also, each of the government agencies should strengthen information training of its own. Related laws and institutions were to be adequately prepared to boost the informatization of public officials. Among others, an information competence test was to be adopted and broadly enforced for public officials, and it was proposed to reflect test results in their performance evaluation criteria.

- Teachers

First, the Ministry of Education, regional offices of education (city/province), and schools of all levels continuously offered informatization training to teachers, each assuming due roles and responsibilities - annually 80,000 teachers would be trained on informatization. Furthermore, commissioned training through specialized educational institutions would also be expanded.

Second, a department specific computer training would be put in place in schools of each level using a phased approach, with a system to foster computer training-specialized teachers to be prepared. On-going training would be provided to schools of all levels to foster more than 10,000 teachers as "informatization leaders" on an annual basis.

Third, related laws and institutions were to be adequately prepared to facilitate teachers' informatization training (e.g. the introduction of an information literacy certification system and an academic credit bank system)

- **Military personnel**

First, 150 on-site computer training facilities would be built by 2002 and used to educate soldiers on information and communications, with 106 opened at army sites of a brigade size or larger, 26 at the naval sites of a warfare group size or larger, and 18 at the air force sites of an air division size or larger. The facilities would be the foundations to enforce information training for 200,00 soldiers every year, ultimately covering all of 600,000 military personnel in Korea.

Second, advanced information training for signal and communications soldiers and commissioned and noncommissioned officers (experts and managers) would be outsourced to private universities and institutes to foster them as true experts.

Third, information training programs for the soldiers other than the signal and communication ones (i.e. general users of information systems) were to be expanded. Commissioned and noncommissioned officers would be tested for information literacy and the results would be reflected in the promotion criteria. Furthermore, professional training would be provided to soldiers to help them obtain computer-related certificates.

- **Salaried workers**

First, information training would be conducted for approximately 200,000 by 2002 through public and private institutes including the Korea Productivity Center and central and regional electronic commerce resource centers.

Second, educational programs using mass media and new media would be more broadly deployed for salaried workers who have little time to take offline courses.

Third, professional training institutes would be commissioned to develop and diffuse new training programs that befit the new corporate environment - CALS/EC, remote work, etc.

- **Undergraduate students**

First, information training at the undergraduate level would be boosted by reflecting the status and quality of related facilities and training in the university evaluation criteria.

Second, virtual universities on the online space, currently being prepared, would be actively promoted, and once established, they would be encouraged to open information training courses.

- Farmers and fishermen

First, the Ministry of Agriculture and Forestry, the Ministry of Maritime Affairs and Fisheries, organizations of producers and related educational institutions would conduct information training for more than 180,000 farmers and fishermen by 2002.

Second, public authorities and regional universities were induced to utilize their own computer labs to offer more training opportunities to farmers and fishermen.

Third, information training would be widely publicized by the responsible departments of local governments and private organizations to motivate the farmers and fishermen who could afford such training to voluntarily participate in training programs.

Fourth, information training centers and computer classes for local residents would be further expanded to support the information training for farmers and fishermen.

- CIO and informatization-responsible public officials

First, the government-run public officials training institutes and private training institutes would be mobilized to foster "CIO professionals". In addition, a "CIO advisor system" would be introduced.

Second, on-going and organized re-training on information and communications would be provided to the officials in charge of informatization through central and regional training institutes for public officials and professional training institutes in the private sector.

- Use of mass media and supply of standard training materials

Informatization training using broadcast media and new media that had big social impacts will be enhanced and standard informatization training materials will be produced.

First, the number of informatization education programs on TV and cable TV channels should be increased. For this, EBS and other cable TV channels should be encouraged produce and broadcast informatization training programs tailored to different needs of social classes and areas. Increase in broadcast of informatization-related special programs through TV would be encouraged.

Second, informatization training using new media such as satellite broadcasting and the internet would be promoted. Satellite channels specialized in informatization training should be secured, and informatization training broadcasting customized for different target audiences and

areas should be carried out through the Korea Information Culture Center. The development of a two-way remote education system using the Internet and multimedia technologies is needed, and the number of "Informatization Counseling Centers" currently run by the Korea Information Culture Center to provide information and educational counseling regarding informatization training should be increased.

Third, standard training materials introducing learners to basic knowledge in an easy language needed in an information society will be produced. Handbooks entitled "Basic Things You Must Know" will be produced. Video programs containing informatization training will also be produced.

- **Improvement of laws and institutions to stimulate informatization training**

Reorganization of related laws and institutions should be sought to include tax support, information competence certification system and to further promote informatization training.

First, the implementation of information competence certification system should be considered to assess information literacy of the public in an objective manner and motivate them to be information-literate. Information literacy had been incorporated in the evaluation system since 1999 in a phased-approach for assessing work performance of public officials and teachers. Also, information literacy would be part of the assessment of junior high school students who take university entrance examinations, starting from the 2002 examination. The implementation of various certification systems in the private sector would be encouraged with a view to identify the information literacy of the general public and motivate them to be more digitally literate.

Second, lowering of ICT-related charges should be sought as a way to support informatization training. Also, lowering of ICT-related charges paid by public education facilities such as schools or private education facilities to provide informatization training should be encouraged.

Third, ways to offer tax benefits to the private sector should be studied to promote informatization training.

Fourth, Internet cafes that had become commonplace in the private sector should be fostered as sound Internet Plaza business places to create an environment where the Internet access is universal. Also, regulations regarding the establishment of Internet cafes should be eased to boost popularity of the Internet among the general public

3.2.2. Digital literacy plan for 10 million(2000~2002)

The Informatization for 10 million people was an initiative aimed at realizing a digital equality by digitally training all Koreans including the information-poor to raise skills of using information technologies among all members of society. The initiative was the government's policy action to tackle the digital divide as there were growing concerns that the digital divide may further widen already existing social and economic gaps between social classes and geographies.

Each initiative had a target number of trainees for each social class as shown below.

Table 1-7 | Target Number of Informatization Trainees by Social Class

(Amount in persons)

Target Group	Department Name	Target Number of Trainees			
		2000	2001	2002	Total
The disabled	Ministry of Health and Welfare	-	41,280	41,280	82,560
	Ministry of Labor	2,265	20,690	41,215	64,170
	Ministry of Information and Communication	15,000	20,000	25,000	60,000
	Sub-Total	17,265	81,970	107,495	206,730
Farmers	Ministry of Agriculture and Forestry	30,756	70,080	70,080	170,916
Fishermen	Ministry of Maritime Affairs and Fisheries	5,000	7,500	7,500	20,000
The elderly	Ministry of Health and Welfare	-	35,400	35,400	70,800
	Ministry of Information and Communication	20,000	35,000	45,000	100,000
	Sub-Total	20,000	70,400	80,400	170,800
Housewives	Ministry of Information and Communication	700,000	700,000	600,000	2,000,000
Detained youths /adults	Ministry of Justice	4,342	12,130	15,130	31,602
Local residents	of Government Administration and Home Affairs	500,000	500,000	500,000	1,500,000
	Ministry of Information and Communication	20,000	30,000	50,000	100,000
	Sub-Total	520,000	530,000	550,000	1,600,000
Salaried workers	Ministry of Labor	200,000	600,000	700,000	1,500,000
Military personnel	Ministry of National Defense	200,000	270,000	270,000	740,000
Public officials	Ministry of Government Administration and Home Affairs	510,000	(510,000)	(510,000)	510,000

Target Group	Department Name	Target Number of Trainees			
		2000	2001	2002	Total
Teachers	Ministry of Education	224,931	195,000	195,000	614,931
Elementary, junior high, high school students (of low-income families)	Ministry of Education	- (500,000)	1,429,831 -	1,434,029 -	2,863,860 (500,000)
	Sub-Total	500,000	1,429,831	1,434,029	3,363,860
Employees of public enterprises	Ministry of Planning and Budget	70,000	70,000	60,000	200,000
Total		3,002,294	4,036,911	4,089,634	11,128,839

Source : Korea Information Culture Center(2002).

Target number of trainees was 3,002,294 in 2000, 4,036,99 in 2001 and 4,089,634 in 2002, totaling 11,128,839. This accounted for a fifth of the entire population in Korea. Housewives, local residents and students accounted for a lion's share of target number of trainees.

3.2.2.1. Informatization programs for each target group

- **Farmers**

Various types of education programs, including group education and home education, were available to meet needs of trainees. The programs were systematically aligned to improve the efficiency of education. On-site education focused on basic programs while group education mainly offers advanced programs. Buses were used to visit remote villages and provide home education.

Theses buses, equipped with training devices, visited about 800 villages and towns to provide education for 18,000 residents. Schools in Eup/Myeon municipal areas and education facilities in cities and counties were used to provide education for 98,000 members of agricultural organizations, and agricultural college students would visit farmhouses of 48,000 residents to provide education. Agriculture Forestry Fisheries Information Service provided professional and scientific farming education.

- **Fishermen**

Local colleges and fishery high schools were designated as informatization training institutions to provide necessary informatization training for current and future leaders of fishing villages. In 2000, 5,000 fishermen were educated by 5 institutions including Korea Institute of Maritime and Fisheries Technology.

National Fisheries Research and Development Institute led efforts to provide both advanced fishery education as well as informatization education using fishery technology management centers in each region, and build a remote education system within the institute to provide education to remote fishing villages where group education is difficult.

Informatization training programs tailored to the circumstances of fishing villages were needed, and software that practically helped fishing management must be developed. For instance, software specializing in fisheries such as bookkeeping for fishing households and aquaculture management needed to be developed to bring fishing households to informatization.

- The elderly

Welfare facilities for senior citizens such as senior welfare centers would be utilized. In so doing, computer basics would be provided to 35,000 senior citizens a year. In addition, computer courses could be opened within post offices and at the Korea Information Culture Center to provide basic computer training to senior citizens.

Curriculum (about 30 hours) and training materials needed to carefully consider the learning capability of senior citizens. PC and instructor support needed to be provided to private institutions such as Korea Welfare Info-Communications Association that carried out informatization training for senior citizens. Training programs should be basic, mainly helping senior citizens learn how to use PC and the Internet.

- Housewives

Some 1,000 computer schools across the nation that were a good place to learn about ICTs could be designated as Internet schools for housewives. Class fee needed to be set at an affordable price, at KRW30,000 (including training materials) after consultation with Korea Association of Hakwon to ease financial burden on housewives and promote participation by housewives.

Along with basic computer training, “how-to” training about information search, home shopping usage and blocking pornographic materials and other training needed in daily life could be provided. Remote training through the Internet, educational channels and cable TV channels could be considered to offer training opportunities in various forms.

A total of KRW6.4 billion of grants were to be provided by 2002 to women’s organizations such as working women’s homes that provided informatization training for housewives. These places could be used as training centers dedicated to women with affordable class fees.

Detained youths/adults

Educational facilities were to be set up in prisons, reformatories and probation offices until 2002 to create an environment for detained youths and adults to increase their information literacy. Such education needed to be conducted on a phased approach basis and in a systematic manner to ensure effectiveness.

First of all, the education should start with basic computer training and then move on to more specialized programs so that detained youths and adults could obtain sufficient technical skills and certificates they could utilize in industries after release from prisons and detention centers. To this end, internal training staff and volunteers should be actively utilized. Various educational institutions could be used to raise such training staff. Aside from internal teaching staff, volunteer groups consisting of professors and university students in the vicinity of prisons and detention centers could be used as teaching resources.

Local residents

Local governments should lead the effort in building up information literacy for local residents through free-of-charge computer training, for instance. Not only training centers ran directly by local governments (351 sites), but also universities or youth centers could be used to provide necessary education to about 500,000 people a year.

The education could be conducted systematically by dividing roles between city, town, county and borough offices. While basic information utilization training could be provided to the general public at the town, county and borough level, intermediate-level training could be provided to key persons at the city and provincial level. 100 information training centers were to be set up in post offices of rural communities and small and medium-sized cities until 2002 to educate about 100,000 residents. Post office information training centers would serve as a place for education, as well as Internet Plaza where the internet was accessible to the general public.

Salaried workers

Study courses should be classified into ‘Informatization beginning course’ and ‘Intermediate and advanced course for applications’ according to the level of training. ‘Informatization beginning course’ should be given in priority to workers who need basic skills to use information technologies including the Internet, and ‘Intermediate and advanced course for applications’ should be provided by the existing training institutions as an additional course.

Target students were divided between incumbent workers and unemployed persons. Training for incumbent workers included training for business owners and subsidized training for other

salaried workers, while training for the unemployed included training for the self-employed.

Financial resource for the training consisted of 'Employment Insurance Fund' and 'Training on General Accounting,' with the former used in the training for business owners, incumbent workers and for re-employment of the unemployed and the latter supporting training for general unemployed persons, newly unemployed persons and self-employed persons.

- Military personnel

Anyone in the military should be allowed to access informatization training during their term of military service. To this end, a total of 150 training centers were to be set up in divisions, brigades and other military camps in 2001. 1,615 Internet training centers and 6,842 Internet cafes were to be opened in battalions and squadrons, respectively, to allow military personnel to learn ICTs and obtain information provider certificates or study courses befitting their branches and duties. Professional training should be available for signal and communications soldiers and information system operation personnel to raise them as professional military ICT resources. On the other hand, basic computer and Internet training should be provided to other rank-and-file personnel.

- Public officials

All public officials should be given informatization training at lease once a year. Training programs should consider their positions and duties. Training for manager-level officials of Grade 4 or above was to be led by the Ministry of Government Administration and Home Affairs, with the focus on raising information competence and literacy.

Training for working-level officials of Grade 5 or below would be the responsibility of heads of relevant organizations, with the focus on raising basic ICT skills to use word processors, e-mails, electronic approvals and information search on the Internet.

Training for public officials engaged in ICT duties should be led by heads of relevant organizations. These public officials should be provided with opportunities to receive training on latest information technologies such as JAVA, web server operations and Delphi, and there should be ways to ensure that such training generates desired results. Officials of Grade 5 or below were subject to the information competence test and the test scores should be reflected in their performance evaluation. Finally, the provision of informatization training would be one of top priorities when training centers developed training plans.

- Teachers

Between 2000 and 2002, informatization training was to be provided to 85,000 teachers, or

25% of all teaching staff each year under the supervision of city and provincial education bureaus. A database containing training results of individual teachers should be built to avoid duplicate training, and the training should be provided by diverse training centers to improve quality of informatization training.

Voluntary participation by teachers in the informatization training and computer-related club activities should be further encouraged to raise their ability to adapt to the information society. One teacher should be raised as an ICT expert in each school to spearhead efforts to run school computer classes, multimedia production, software development, as well as bring students and schools online.

- **Students of elementary, junior high and high schools**

It was recommended that, starting in 2001, computer classes be introduced as a compulsory subject in the curriculum for first and second-year elementary school students and expanded to include third and fourth-year students in 2002. At least 34 hours a year should be allocated for students to study computers through alternative course or extra-curricular activity. As part of continued institutional efforts to ensure effectiveness of the computer training, 'Curriculum Development and Operation Guidelines' and 'Textbook Compilation Guidelines' should be further refined such that computer training is incorporated in both guidelines. Targets should be set for each level of computer education and for each grade of students to ensure that computer training is carried out in an organized and effective manner. Some 500,000 children of low-income families with limited access to computer training should be given the training free-of-charge, and high performers among these students should be provided with PCs and subsidies for using the Internet for five years.

- **Employees of public enterprises**

A task force team dedicated to informatization should be set up in all public enterprises and be given the mandate of planning and executing related training plan each year. In-house training and education centers were to be utilized as many as possible to educate 200,000 employees by 2002. Programs should be differentiated to satisfy the needs of public enterprises. As public enterprises tend to have much higher levels of informatization compared with other social classes such as housewives, more professional and specialized training would be needed. For instance, training on electronic procurement, ERP system and other best practice information systems could be intensively provided.

- **The disabled**

It was recommended that a total of KRW7 billion of grants be provided until 2002 to

organizations that offer informatization training for disabled people. The grants should be used to build training and education centers dedicated to educating about 60,000 disabled people. The education program should be primarily basic enough to teach how to use computers and gradually raise the level to include special training needed for the employment of disabled people.

Informatization training using welfare facilities for the disabled should be enhanced to benefit about 83,000 people admitted to such welfare facilities. Vocational schools to raise technical capabilities of the disabled should be established. 5 vocational schools under Korea Employment Agency for the Disabled should be established where 19 informatization-related curriculum courses including multimedia and data processing should be opened to develop technical resources among the disabled. It was advised that such schools be set up in Ilsan, Daejeon and Busan in 2000 and then in Daegu and Jeonnam in 2002.

It was also recommended that 19 'Internet Centers' be set up in regional offices of Korea Employment Agency for the Disabled until 2002. The offices would offer computers, teachers and special equipments to provide basic computer training and other opportunities to utilize information.

A total of KRW3 billion should be invested in 2002 in a joint collaboration with organizations for the disabled for the development of ICT devices and related software to be used by the disabled for their easier access to ICT services. Those ICT devices should be made available to the organizations for the disabled and other educational institutions free-of-charge or at low prices considering the purchasing power of the disabled.

3.2.2.2. Outcome of the Digital Literacy Plan for 10 Million and lessons learned

The 'Digital Literacy Plan for 10 Million' initiative aimed to provide informatization training to about 11.13 million Koreans between 2000 and 2002. This target was over-accomplished by educating 13.80 million people by the end of June 2002. The Ministry of Information and Communication played a crucial role in over-accomplishing the target by actively supporting the informatization training of detained youths and adults (Ministry of Justice); military and police personnel (Ministry of National Defense and the National Police Agency); farmers and fishermen (Ministry of Agriculture and Forestry and the Ministry of Maritime Affairs and Fisheries); teachers and students of low-income households (Ministry of Education and Human Resources Development); the disabled (Ministry of Health and Welfare); and small and medium-sized enterprises (Small and Medium Business Administration).

The outcome analysis of the national-level informatization training initiative commissioned by the government to an independent research institute shows that the number of Internet users in Korea increased from 3.1 million in late 1998 to 24.38 million in late 2001, accounting for

56% of the whole population. Internet access by the vulnerable social classes also grew: Internet use ratio among females grew from 7.7% to 57.8%; from 1.2% to 20.7% among senior citizens; and 5.0% to 36.0% among low-income households during the same period. Economic impact on ICT-related industries is valued at KRW1.6 trillion, and individual productivity improvement is estimated to have generated KRW4.5 trillion of economic value through time savings, etc. The level of satisfaction felt by the trainees was 4, on a scale of 1 to 5, indicating the training was quite effective.

Table 1-8 | Korea's Internet Usage Rate (1999~2001)

Year	1999	2000	2001
Rate	22.4%	44.7%	56.6

Source: Korea Communications Commission, Korea Internet & Security Agency (2009).

Despite such outcome, however, it is pointed out that the informatization training was not sufficient enough for Koreans to reach the competence level required to use information productively and soundly in their daily life and in their economic activities. Moreover, it was found that only 36.9% (19% of the entire population) of computer users are able to use application software. These findings brought the government to the implementation of Phase 2 Digital Literacy Plan in July 2002 that emphasized more practicality in the education to encourage Koreans to use information in a more productive and sounder manner, rather than spend time in games or chats.

3.2.3. Phase 2 Digital Literacy Plan (2002~2004)

The 'Phase 2 Digital Literacy Plan' was an initiative formulated in a joint effort by 12 government departments to promote 'e-Koreans' who were both consumers and producers (i.e. prosumers) of information through digital training. The initiative had a goal of providing digital education to a total of 5 million people until 2004. Specifically, the initiative aimed to develop 3.5 million e-Koreans able to practically utilize information technologies and provide basic computer and Internet training to 1.5 million disabled people and senior citizens. The goal of the phase 2 digital literacy plan was to help people raise practical skills of using information at home and at work while continuing the effort to bridge the digital divide by providing basic education for the disadvantaged.

3.2.3.1. Digital literacy initiatives pursued by the Ministry of Information and Communication

The digital literacy initiatives the Ministry of Information and Communication pursued through Korea Agency for Digital Opportunity and Promotion in 2002 include digital education

tailored to the characteristics of the vulnerable social classes, such as digital education for the disabled, digital education for senior citizens and e-business training for women. In addition, 'Post Office Information Training Centers' were designed to provide basic digital education free-of-charge to residents in rural areas, while 'Information and culture promotion centers' mainly targeted Seoul citizens and 'e-Korean training' was aimed at providing intermediate-level digital training using about 400 private educational institutions throughout the nation. Other initiatives created to support the informatization training included 'Informatization training instructor support,' 'Online informatization training' and 'National digital literacy assessment scheme.'

Table 1-9 | Digital Literacy Plan of the Ministry of Information and Communication

(Amount in KRW million, persons)

Initiative Name	Budget	Target Population	Initiative Name	Budget	Target Population
Operate instructor support group	1,198	45,000	Informatization training for the elderly	1,000	40,000
Post office informatization training center	2,300	67,700	Develop informatization leaders among teachers	200	600
e-Korean education	6,020	80,000	Information and culture promotion centers	456	9,000
e-Biz education for housewives	6,300	50,000	Online informatization training	610	120,000
Informatization training for the disabled	4,000	18,600	National digital literacy assessment scheme	377	60,000
Total				22,461	490,900

Source: Korea Agency for Digital Opportunity and Promotion(2004).

In addition to directly carrying out informatization training, the Ministry of Information and Communication also played a role in closing the digital divide by assisting the Ministry of Education and Human Resources Development, the Ministry of Justice, and other departments with their informatization training efforts.

For instance, the Ministry of Information and Communication provided KRW36.8 billion in 2002 to support 8 projects undertaken by 6 government departments. It planed to provide additional KRW28.3 billion in 2003 for the education of 24.8 million people through 9 projects to be carried out by 7 government departments. Education in 2003 was in line with the phase 2 digital literacy plan and puts higher focus on practicality to improve the user's data usage productivity and ability to find jobs. Moreover, the education came in more diverse

forms, including home education and online training, considering different characteristics of trainees and to meet their varying needs. Workshops were held and best practice cases were shared to generate better training outcome and to manage and evaluate project results more effectively.

Other initiatives led by other government departments and supported by the Ministry of Information and Communication are as follows:

Table 1-10 | Major Initiatives undertaken by Government Departments to Address the Digital Divide

Department	Major Initiatives
Ministry of Education and Human Resources Development	• Conduct job training needed to informatize teachers • Subsidize children of low-income families for computer lease and Internet access
Ministry of Justice	• Establish new informatization training centers and support acquisition of certificates
Ministry of Government Administraion and Home Affairs	• Enhance education for local residents and public officials
Ministry of Culture and Tourism	• Develop a national e-library web site for visually handicapped people and develop e-Korean dictionary
Ministry of Agriculture and Forestry	• Enhance informatization training for farmers and provide PCs to farming houses
Ministry of Health and Welfare	• Support provision of PCs for fatherless families • Enhance informatization training for the disabled
Ministry of Labor	• Carry out informatization training for workers and the disabled • Expand employment information system to include the disabled
Ministry of Information and Communication	• Extend loans for investing in informatization facilities in rural areas • Expand free Internet access facilities and provide used PCs to post offices and local governments • Enhance informatization training for the information poor, including the disabled, the elderly and females
Ministry of Maritime Affairs and Fisheries	• Carry out informatization training for fishermen and establish fishing village information rooms

Source: Korea Agency for Digital Opportunity and Promotion(2004).

3.2.3.2. Initiatives to support informatization training of other government departments

- Ministry of Education and Human Resources Development

A number of initiatives aimed at resolving the digital divide were being undertaken by various government departments. More specifically, the Ministry of Education and Human Resources Development provided grants for PC and online use to provide a wider access to information technologies and resolve the digital gap for teen heads of household and other students of low-income families. 50,000 students became beneficiaries of this program.

- Ministry of Justice

The Ministry of Justice had been taking efforts to address the digital gap among the information-poor, including detained youths and adults, probationers and people in care and custody by providing them with opportunities to access information technologies. To this end, the ministry had consistently expanded information technology infrastructures to allow all target users to study, obtain certificates, find jobs and choose schools.

Specifically, efforts were made to replace training devices, build latest education facilities to improve informatization training environment, increase opportunities for detained youths and adults, probationers and people in care and custody to receive informatization training and obtain more than 2 certificates per person, provide professional training and help obtain professional licenses so that they can successfully go on to study at schools or find jobs. Business incubation centers were established to provide professional training needed for detained youths to start their own businesses, and Internet broadcasting stations were built to allow detained youths to raise broadcasting skills by participating in online education and content production. In addition, community activities involving local residents and the disabled were encouraged to build up an upright character for target trainees.

- Ministry of Government Administration and Home Affairs

The primary goal of informatization training pursued by the Ministry of Government Administration and Home Affairs was to bridge the digital divide among public officials and local governments. Urban-rural blended cities and low-level municipal areas (Eup/Myeon) where informatization progress is relatively weak were selected as target areas, and intensive support for farmers, fishermen, the self-employed, full-time housewives and the elderly was provided. Informatization training for public officials was also strengthened to help them provide better services to the public and improve administrative efficiency. To do this, information technology infrastructures were continuously expanded to provide more training

and raise competence in using information.

The initiatives undertaken by the ministry can be summarized into three categories: First, build futuristic and advanced information network villages for invigorating local economies and promoting welfare in rural areas; Second, ensure that the informatization in these areas actually benefits people engaged in farming and fishing in terms of income generation and productivity, in addition to wider access to the Internet, while establishing new education facilities providing training that is helpful in real life and that meets expectations of local residents; Finally, enhance informatization training for public officials and expedite realization of e-government to offer better administrative services.

First, the construction of 25 information network villages was completed in 2002 in a first stage and construction of additional 78 villages was completed in June 2003 in a second stage. After the Roh Moo-hyun government was launched, a general plan for building information network villages in a third stage was finalized in July 2003. Under the plan, 77 villages would be turned into information network villages−4 in city type, 4 in Eup/Myeon type, 28 in small village type, and 41 in medium-sized village type.

Second, the ministry carried forward an initiative to educate 1.5 million local residents a year. 2.33 million people were educated in 2003, a 155% accomplishment versus the target. 1,397 training centers employing 10 or more employees across the country were in the middle of carrying out the education, and a total of 38,770 PCs had been secured. In addition, a total of 2,521 internal and external instructors were mobilized to provide seamless education.

Third, the ministry also pursued another educational initiative aimed at promoting informatization for public officials. A general plan targeting public officials was developed in April 2000 and was informed through each local education bureau to relevant schools. A plan on invigorating Internet usage by public officials was developed in November 2000, and an informatization training plan for public officials was developed in 2002.

● Ministry of Culture and Tourism

The focus and objectives of initiatives undertaken by the Ministry of Culture and Tourism to address the digital divide are as follows. A magnifier functionality was developed to allow visually handicapped users to conveniently read and use text and index information stored in the national e-library, and a web site offering voice and braille services of the Korea library information system database as well as Korea library index system database was established to allow visually handicapped people to access national information and knowledge resources and use them in research.

Additional efforts made by the ministry include installation of aids in the National Central Library and other digital facilities in public libraries (at two places including Chungju City Library). Also, usage guides for the disabled became available on the website of the National Central Library, electronic voice information devices, book enlarger, and audio book readers can be used at public libraries. In addition, the list of about 2.5 million publications and index information for 970,000 books stocked at the National Central Library could be digitally accessed; text information for 521,121 pages of 1,430 books in other categories could be read using voice or braille services; and text information database of other 900 books was compiled in a database for 306,000 visually handicapped readers.

● Ministry of Agriculture and Forestry

Initiatives led by the Ministry of Agriculture and Forestry are mainly aimed at providing a wider and universal access to information by farmers. To this end, the ministry installed digital reception rooms and PCs in remote towns for farmers to access information and raise information competence needed in their farming.

The ministry also worked to digitize the distribution of agricultural products by building a system supporting shipments of agricultural products, a website for e-commerce and an integrated shopping mall to improve the distribution of agricultural products as well as increase incomes of farming families. Support for Internet-based agricultural information services including information on individual products, welfare, and living information on rural areas had been increased.

Information technology infrastructures have been established to provide high-speed Internet access to rural areas. PC penetration rate rose to 33.6% in 2003 as a result of subsidizing repair work of some 4,500 used PCs supplied to rural areas.

Meanwhile, the campaign to send PCs to rural areas has been the responsibility of agricultural cooperatives and municipalities since 2005. Support for setting up digital reception rooms, a facility where access and use of information is free, was provided to 5 villages, and a technology counseling system supporting direct video discussions between researchers and farmers was built in 60 sites. Furthermore, various information on the distribution of agricultural products, technologies and lifestyle is widely available on the agricultural information portal (www.affis.net) as well as web sites of each organization. As the usage of these information services is on the increase, the ministry is now focusing on the development and provision of content helpful to farmers.

Informatization training for farmers focuses on raising the ability of farmers to use information in their actual farming. 70,000 farmers received the informatization training in 2003.

Ministry of Health and Welfare

Initiatives led by the Ministry of Health and Welfare primarily focus on improving information access and information use capability among senior citizens and eventually upgrade welfare for senior citizens in preparation for an aged or super-aged society. The main goal of initiatives designed to resolve the digital gap is to ease the sense of alienation and stir up self-esteem by promoting participation of the elderly in social activities. To this end, various education facilities for the elderly were used to carry out the informatization training.

These efforts are evaluated as having mitigated a sense of intellectual and functional alienation while boosting a sense of belonging and self-esteem among senior citizens, as well as the level of satisfaction with life. The use of senior welfare centers is also regarded as being effective in providing convenience, variety, inter-connectivity and efficiency.

Ministry of Labor

The Ministry of Labor has been keen on assisting salaried workers and jobless people in accessing a wide range of information technologies and enhancing capabilities needed to better perform work duties and find jobs, while providing basic training to the vulnerable to raise their adaptability in society. Also, Internet is used to provide comprehensive information on recruitment, job search and vocational rehabilitation to satisfy information needs of the disabled, and 'Internet Centers' are operating in each region to raise information literacy of the disabled. The ministry is also pursuing other efforts to resolve the digital divide by providing online education for the disabled who cannot travel easily.

As for the outcome of initiatives undertaken by the Ministry of Labor, informatization training was provided to 267,000 salaried workers and the self-employed 29,649 jobless people and 237,681 salaried workers (84.0% of target number) in 2003, and a web-based employment information system for the disabled is in operation in 20 industrial complex sites and 156 vocational rehabilitation service centers since December 2003. Internet centers for the disabled offering basic computer training, OA course, Internet search, and study group course as the main curriculum were operated at two sites in March 2001 and then at five sites in 2002. An online education system for the disabled dedicated to carrying out more professional programs such as IT certificates, office automation, government-certified Internet licenses and foreign languages was put into operation in May 2002. Meanwhile, polytechnic colleges and technical schools across the country provided vocational competence development and training to support effective rehabilitation of the disabled in society.

- Ministry of Maritime Affairs and Fisheries

The Ministry of Maritime Affairs and Fisheries set the goal of developing 25,000 digitally literate fishermen to lead the informatization of fishing villages, and establishing infrastructures to support lifelong education for fishermen. To this end, Internet education was provided mainly to young leaders through the ministry's regional offices and the National Fisheries Research and Development Institute.

A knowledge sharing system for fishermen with remote education capability was built at 31 sites. Information on 31 coast areas including Seoul, Incheon, Jeju and Ulleung was incorporated into a single remote network to enable real-time remote education, counseling, discussions, and meetings. A remote video conference system was built particularly for residents in Ulleung and Jeju islands to address civil complaints in those areas.

In addition, fishing village reception rooms were opened in 293 locations to raise information literacy of fishermen, and a knowledge sharing system (www.badaro21.net) providing remote education, counseling services as well as share fishery knowledge and information was implemented for fishermen who find it difficult to leave their work sites. Finally, a website covering 40 fishing villages was built to provide information on 12 fishing village cooperatives, major specialties, tourist attractions, major sea food marketplaces and marine products.

3.2.3.3. Outcome of the Phase 2 Digital Literacy Plan and lessons learned

Under the phase 2 digital literacy plan, informatization education was provided to a total of 9,077,087 people between July 2002 and June 2004-practical training to 5,024,053 people and basic training to 4,053,034 people-exceeding twice the 5 million target, 6 months ahead of scheduled deadline.

Table 1-11 | Outcome of the Phase 2 Digital Literacy Plan

	Target	2002	2003	2003	2004	Cumulative Total
Practical	3,520,500	1,404,746	954,176	1,850,713	814,418	5,024,053
Basic	1,522,700	1,561,340	542,758	1,169,219	779,717	4,053,034
Total	5,043,200	2,966,086	1,496,934	3,019,932	1,594,135	9,077,087

Source: Korea Agency for Digital Opportunity and Promotion(2005).

Informatization education also played an important role in making Korea an IT powerhouse with the average Internet usage rate rising from 22.4% in 1999 to 70.2% in 2004.

Despite such an outcome, however, a gap still existed between people with disabilities, senior citizens, low-income households, farmers and fishermen with a relatively weak access to information services and the general population. A survey on the digital divide index conducted in 2004 for the first time in Korea, as presented in Table 1-12, clearly shows digital disparities between the disadvantaged groups of society and the general population (= 100) for three types of indices.

Table 1-12 | Digital Divide Index of the Disadvantaged vs. General Population

Index	General Population	Average of the Disadvant aged	People with Disabilities	Low-Income Households	Farmers and Fishermen	Less-Educated	Citizens Aged 50 or Older	Remark
Access to information	100	36.3	72.4	46.9	50.6	58.7	65.1	
Digital literacy	100	72.5	42.0	26.3	18.8	9.5	17.4	
	100		76.6	82.1	64.7	51.5	58.8	Based on PC users
Quantitative information utilization	100	65.8	39.6	29.1	17.9	9.9	18.2	
	100		76.9	97.3	69.7	58.2	65.0	Based on PC users
Qualitative information utilization	100	70.4	41.4	24.3	19.3	9.3	20.3	
	100		80.5	72.6	75.4	55.2	65.0	Based on PC users
Compound Index	55							

Source: Choi Doo-jin *et al.* (2004).

As shown in Table 1-12, the digital divide is wider in the digital literacy and information utilization indices than in the access to information index. That is, access to computers or Internet among most of the disadvantaged groups of people is getting better with the index exceeding 50 vs. 100 of average population. However, in the digital literacy that refers to one's ability to use computers or Internet, the index among the disadvantaged groups was just around a quarter of that of general population. Information utilization index that measures how much or how well one uses computers or Internet also showed around one-fourth the level of general population among the disadvantaged groups. In addition, even when only people using computers are taken into account, people with disabilities, senior citizens, and the less-educated were found to be able to utilize information at just approximately 70% level of the general population.

4. Outcomes of Internet Education for All

4.1. Improved Ability to Utilize Information

As a result of the informatization policies implemented since 1999, the broadband access has reached most of rural areas nationwide, and Korea became one the world's most computer literate countries through intensive informatization education for the general population as well as the disadvantaged groups of people. Major accomplishments across various measures are as follows:

To begin with, the government has assisted rural communities since 1999 with loans necessary for building high-speed information and communications network in rural areas. As a result, broadband access expanded to all 205 Eups and most of Myeons by the end of 2004 with 95% of rural households, or 3.3 million out of 3.47 million rural households. For people with lack of access to PC or Internet at home, Public Access Points where access to information is free at public places like dong offices and post offices were set up. As of the end of 2004, a total of 8,263 public information access facilities opened to enable people to access computers or Internet to do their work or get information. Besides these facilities, 191 information network villages were set up, 25 digital reception rooms were opened in agricultural areas and 393 fishing village reception rooms were established in fishing villages, making Korea the world's best supplier of public access to information services and technologies.

Subsidies were provided for children in low-income households (50,000 children) for leasing PCs and using communications services, and used PCs (54,650 units by the end of 2004) and assistive information products (6,773 units by the end of 2004) were distributed to support people with disabilities, senior citizens and low-income households, which led to lessened disparities in terms of access to information due to physical or economic reasons.

As examined so far, the government's active effort to narrow the digital divide substantially contributed to providing wider opportunities to access information for the disadvantaged groups of society, thereby allowing anyone to access computers or Internet as long as they want. However, lack of access to information in some islands and remote areas, distance to public information access centers, and limited time for using information services remain as problems. Besides, the computer penetration rate among low-income households and rural residents is still below 50%, showing more than 30%p access gap with average households, and efforts to improve access to information for people with disabilities are still not sufficient.

Meanwhile, the Korean government has paid great attention to diffuse informatization education not only for the disadvantaged but also for the general public as a whole to tackle the

digital divide. With a vision to make Korea as the world's most computer literate country, 10 ministries jointly developed the Digital Literacy Plan for 10 Million 2000-2002 in 2000 and provided informatization education to 13.80 million Koreans until June 2002. This was followed by the Phase 2 Digital Literacy Plan July 2002-2004 with enhanced focus on practical education. Under the plan, 9.07 million Koreans were educated, exceeding twice the original 5 million target.

Table 1-13 | Target Number of Trainees vs. Actual Number of Trainees of Informatization Education

(Amount in Thousand Persons)

	Digital Literacy Plan for 10 Million		Phase 2 Digital Literacy Plan	
	Target	Actual	Target	Actual
The disabled	206	101	197.8	178.7
Farmers	171	129	220	153.9
Fishermen	20	16	25	20.9
The elderly	171	443	190	389.7
Housewives	2,000	434	-	-
Detailed youths, prisoners	32	120	108.6	105
Local residents	1,600	5,359	1,892.3	5,430.6
Salaried workers	1,500	1,435	1,050.7	940.7
Military personnel	740	623	410	709.6
Public officials	510	510	600	821.2
Teachers	615	1,109	282.5	255.2
Students	3,364	3,373	66.3	71.5
Employees of public enterprises	200	153	-	-
Total	11,129	13,805	5,043.2	9,077

Source: Choi Doo-jin (2005).

As a result of such efforts, the Internet usage rate in Korea grew from 44.7% in 1998 to 72.8% in 2005, positioning Korea as a country with the highest Internet penetration rate. The engagement by the disadvantaged, such as people with disabilities, senior citizens, farmers and fishermen in the information society, has also greatly improved.

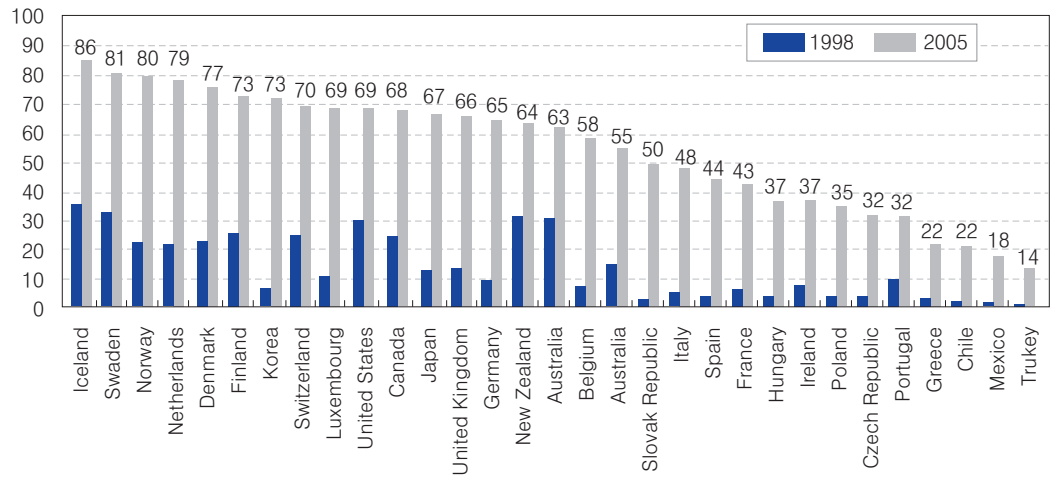
Table 1-14 | Key Informatization Indicators in Korea

	1998	1999	2000	2001	2002	2003	2004	2005
Number of broadband subscribers (in ten thousand)	1.4	37.4	401	781	1,040	1,118	1,192	1,219
Internet usage rate (%)	-	22.4	44.7	56.6	59.4	65.5	70.2	72.8
E-commerce transaction rate (%)	-	-	4.5	9.1	12.8	15.1	19.3	19.8
Number of Internet banking subscribers (in ten thousand)	-	-	409	1,131	1,771	2,275	2,427	2,673

Note: Internet usage rate is calculated using a nationwide survey since 1999.
Source: National Information Society Agency (2006).

Korea's ranking in national competitiveness concerning the use and landscape of the internet greatly jumped from a low ranking in 1999 when no nationwide digital literacy plan existed to a high ranking among the OECD countries in 2005. In terms of the number of Internet users per 100 inhabitants, Korea ranked as low as 20th with 7 users in 1998, but ranked 7th in 2005 with 73 users, a 983% growth rate, among the OECD countries.

Figure 1-3 | Number of Internet Users per 100 Inhabitants (1998 vs. 2005)

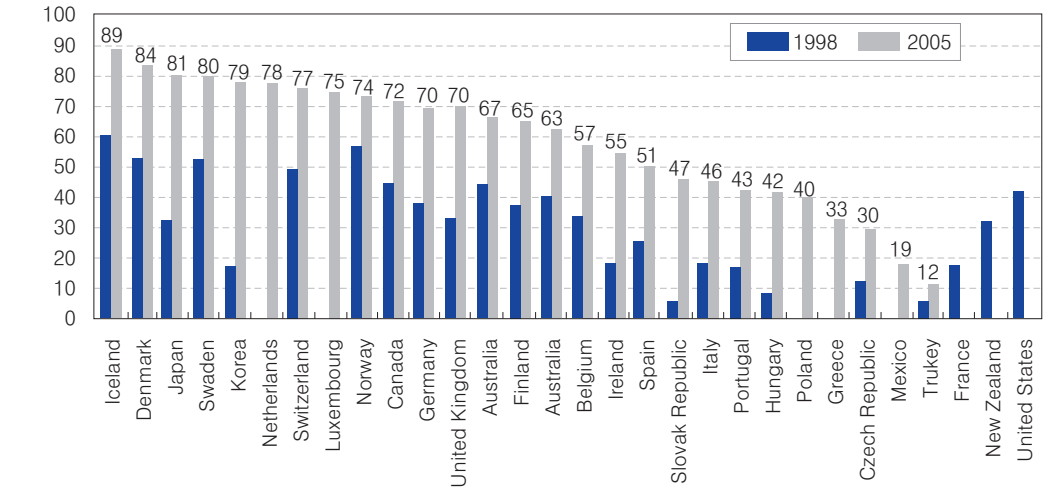


Source: ITU Database (as of December 2010).

In the percentage of households owning computers, Korea ranked 20th with 18% in 1998, but ranked 5th in 2005 with 79% among the OECD countries.

Figure 1-4 | Percentage of Households Owning Computers

(Amount in %)

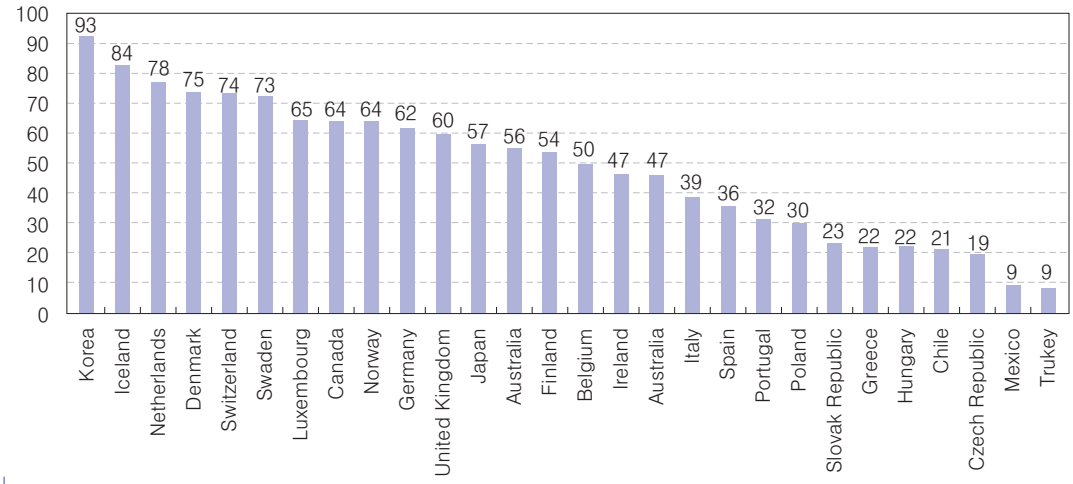


Source: ITU Database (as of December 2010).

Moreover, almost all Korean households - 93% of all households - had access to the internet, which was the highest among the OECD countries.

Figure 1-5 | Percentage of Households able to Access Internet at Home (2005)

(Amount in %)



Source: ITU Database (as of December 2010).

4.2. Creation of Demands for the ICT Industry and Economic Effects

4.2.1. Creation of Demands for the ICT Industry

Efforts to bridge the digital divide are judged to have triggered demands for the ICT industry. The establishment of information and communications network, diffusion of Internet PCs, development of technologies and competition among service providers played a role in lowering prices of ICT devices such as PCs as well as information services, subsequently increasing demands for ICT devices. Particularly, the provision of informatization training is evaluated to have contributed to creating new demands for the ICT industry. Efforts to bridge the digital divide are further expected to increase the number of Internet users, ease the digital divide between social classes and geographies, and substantially boost the growth of IT-related industries. For example, the number of Koreans using the Internet grew from 3.1 million in late 1998 to 26.27 million in late 2002, accounting for 58% of the whole population. Among these users, the number of the alienated increased, from 14.8% in late 1999 to 50.2% in late 2001 for females, from 2.9% to 8.7% for the elderly and from 29.6% to 36.8% for low income households during the same period. According to Yeom Jae-ho et al. (2002), the economic

Table 1-15 | Economic Impact of Informatization Education for 10 Million and Calculation Formula Economic Impact of Informatization Training

	Areas Assessed	Unit Value of Economic Effect (A)	Months/Years (B)	Population (C)(C=OutcomeXWeight 1)	Total(AXBXC)
IT-related industries	H/W purchase and maintenance cost (year)	KRW180,040	1 year	5,185,518 (5,859,342X0.885)	KRW933,600,660,720
	S/W purchase and maintenance cost (year)	KRW44,230	1 year	5,185,518 (5,859,342X0.885)	KRW229,355,461,140
	ICT usage fee (monthly average)	About KRW2,470.94 =0.084(8.4%)X KRW29,416	12 months	5,859,342	KRW153,757,236,378
	Information service usage fee (3 months)	KRW2,260	4th quarter	5,859,342	KRW52,968,451,680
	Spending for informatization training (monthly average)	KRW718	12 months	5,859,342	KRW50,480,090,672
	ICT book purchase cost (monthly average)	KRW2,917	12 months	5,859,342	KRW208,897,260,984
	Internet-based financial transactions (monthly average)	KRW2,58.42	12 months	5,859,342	KRW18,170,053,916
	Sub-Total				KRW1,647,233,215,410

Note: The weight represents the share of answers by one respondent in a survey conducted at a family level. It is the ratio of people who have received informatization training within the families. 0.835 (=1/1.13)

Source: Yeom Jae-ho *et al.* (2002).

impact of the informatization education initiative for the information-poor on related industries is estimated to be as much as KRW1.6472 trillion, as shown in Table 1-15.

4.2.2. Productivity-enhancing Effect Among Individuals

According to Yeom Jae-ho et al. (2002), informatization education is believed to have created about KRW4.5484 trillion of productivity-enhancing effect among individuals, as shown in Table 1-16. Specifically, it is found that the information-trained group uses information more actively in their housekeeping work, shopping and other housework and subsequently saved 17.2 minutes a week in their domestic work, which corresponds to about KRW411.1 billion of productivity increase. The information trained group also enjoys KRW2,606 of relative benefit per person every week from conducting Internet-based financial transactions such as funds transfer, which corresponds to about KRW183.2 billion in gross terms. The same group is believed to be able to save about KRW3115.5 billion by cutting work-handling time by 2.83 hours a week. Productivity improvement led to the increase in their income levels: it is estimated that the information-trained group earns KRW238,523 a year more than the non-trained group, which is about KRW838.6 billion increase in income in gross terms.

Table 1-16 | Increase in Individual Productivity Resulting from Informatization Informatization Training

Areas Assessed			Unit Value of Economic Effect (A)	Months/Years (B)	Population (C)(C=OutcomeXWeight 1)	Total(AXBXC)
Productivity-enhancing effect		Internet-based financial transaction (monthly average)	KRW2,606.10	12 months	5,859,342 persons	KRW183,240,374,234
		Housework hour reduction (year)	KRW70,165.68	1 year	5,859,342 persons	KRW411,124,715,783
		Work processing time reduction (year)	KRW886,193.11	1 year	3,515,605 persons (5,859,342X0.60)	KRW3,115,504,928,428
	Calculation	Yearly average income increase (year)	KRW238,523.08	1 year	3,515,605 persons (5,859,342X0.60)	KRW838,552,932,663
		Sub-Total				KRW4,548,4225,951,162

Note: As the study is limited to employed persons only, the ratio of employed persons within the population (information-trained group) is estimated. It represents the ratio of the employed, among the persons studied, within the information-trained group. 0.60=269/450.

Source: Yeom Jae-ho *et al.* (2002).

Efforts to bridge the digital divide will also help accelerate the transition of the Korean economy into a more knowledge and information-based one. In Korea, the quality of human resources has been the critical determinant of an income gap between industries. If the labor quality greatly differs among different industries, the focus of policy needs to be placed on

providing support to facilitate a transition into a highly-skilled industrial structure and on providing programs aimed at improving skills of the labor force. Income inequality based on educational background and the size of enterprises grows significantly. Among new workers including university graduates, the ratio of highly-paid, specialized jobs increased by 3.1%p to 28.7% from 25.6% a year earlier (Ministry of Labor, 2002). Considering such income gap, efforts to close the digital divide will increase the chance for the information-poor to find jobs in the ICT industry, while at the same time improving productivity, income and quality of life of individuals. In fact, informatization training is found to have directly improved the digital literacy among individuals. In terms of 'information mindset,' for instance, informatization training resulted in raising the desire for better information capability in both the information-poor and the information-rich.

When measured by the number of certificates possessed, only 5.0% of the information-poor held certificates, whereas 26.0% of the information-rich owned certificates. Both groups responded that they felt their knowledge about information technologies has improved: 86.6% of the information-poor and 90.0% of the information-rich responded positively. When measured by the utilization of information technologies in economic activities, including e-commerce, purchase of information services and execution of financial transactions, the information-poor spent KRW1,598 and the information-rich spent KRW2,082 on average on utilizing information services. When measured by the number of the Internet-based financial transactions performed, the information-rich executed 2.75 times per month on average, while the information-poor performed 1.73 times. 'Information productivity,' is another indicator relating to direct effects of informatization training and is measured using labor efficiency that looks into labor reduction time within families and labor reduction time within work places. The information-trained group was able to reduce 79.4 minutes of labor time within families per week on average while the non-trained group reduced 70.4 minutes. In work places, the information-trained group managed to cut 9.3% of labor time while the non-trained group saved 4.4% of labor time per week on average. In both cases, the information-trained group showed more time savings and higher time-saving ratio. When it comes to yearly income growth, the information-trained group saw their income grow by 2.5% a year on average. The number was 1.8% for the non-trained group. As such, informatization training aimed to bridge the digital divide not only facilitates the transition of the industrial structure into a more sophisticated structure but also boosts the knowledge-based productivity of individuals.

4.3. Political, Social and Cultural Aspects

It is difficult to measure qualitative political, social and cultural effects of closed digital divide. Here, the qualitative effects include social, cultural effect and effect on individuals' quality of life.

According to the Information Cultural Center (2003), 92.7% of the information-trained group used the internet, while 63.0% of the non-trained group used the internet. In terms of the number of e-mail IDs possessed, the information-trained group held 2.07 accounts on average as opposed to 1.98 accounts held by the non-trained group users. When measured by the number of e-mails sent per day, the information-trained group sent 1.98 messages per day on average versus 1.51 messages in the case of the non-trained group. In the use of homepage, 24.0% of the information-trained group uses their homepage while only 7.8% of the non-trained group uses their homepage. When it comes to the use of the Internet, both groups showed high percentage with 100% of the information-rich saying that they use the Internet and 91.7% of the information-poor saying. The study also asked a question if they use online public services to find out political effect. 15.7% of the information-non-trained group said yes, while 21.1% of the information-trained group said yes. When measured by online public forum activity, 16.7% of the information-non-trained group showed participation in such activity, while the information-trained group showed 11.1% higher rate at 27.8%.

Bridging the digital divide has greatly contributed to improving the quality of life of individuals. In Korea, as part of the effort to bridge the digital divide, informatization education was conducted for approximately 10.86 million persons including housewives, farmers and fishermen by March 2002. The satisfaction survey of the trainees recorded an average score of 4 (good) on a scale of 1 to 5, showing a relatively high level of satisfaction. In addition, a study on the effects of information training on improving information use found out that the information-trained group posted higher results than the non-trained group in terms of computer use, computer use time, internet usage rate, and personal homepage as seen in Table 1-17.

Table 1-17 | Comparison of Improvement in Information Use between the Information-trained and the Non-trained

	Information-trained	Non-trained	Difference
Use of computer	99.8%	69.1%	30.7%
Time of computer use	89.8 min.	63.8 min.	26 min.
Internet usage rate	92.7%	63%	29.7%
Personal homepage	24%	7.8%	16.2%

Source: Korea Agency for Digital Opportunity and Promotion(2003).

5. Implications

Rationale behind the Korean government's informatization policies is its recognition that fundamental rights of its people must not be hampered by digital disparities as the Korean society increasingly becomes open, horizontal, and decentralized. Korean informatization policies, such as the Comprehensive Digital Literacy Plan established in 1999, the Digital Literacy Plan for 10 million developed in June 2000 and the Phase 2 Digital Literacy Plan created in 2002, have been paying much attention to digitally educating people who had poor access to information services with good results.

As examined earlier, the positive outcome of Korea's nationwide informatization policies was driven by its ICT infrastructure. The construction of fiber-optic cables connecting 144 major cities across the nation was completed in December 2000, thereby enabling people living in areas as small as Eup and Myeon communities to access broadband Internet. Korea also became the first country that expanded broadband connections to all 10,400 elementary, middle, and high schools nationwide. Such a world-class information infrastructure became the basis of boosting the number of Internet users from 3.1 million in the end of 1998 to 24.38 million by the end of 2001, which further grew to reach 31.58 million by the late 2004. The number of broadband subscribers in Korea grew from 14,000 in 1998 to 7.81 million in 2001, and then to 11.92 million by December 2004, which was the highest rate of broadband penetration in the world. In the number of broadband subscribers per 100 households in 2003, Korea recorded 23.3 households, far outpacing second-place Hong Kong which had 18 households.

Besides the world's most advanced high-speed information infrastructure, Korea also obtained remarkable achievements in terms of using information technologies in real life as demonstrated in its broadband service usage rate, time spent to use Internet per person, online stock trading and online banking. Such a widespread use of ICTs gave rise to changes in individual and business activities as well as in the way people thought about and participated in politics, economics, and society and cultural. The open and networking nature of ICT blended with the Korean culture in a synergistic way, accelerating dynamic and innovative social changes rarely seen in other countries. Especially, Korean culture, which is characterized by strong passion for knowledge and accomplishment, is believed to have played a big role in the successful nationwide informatization drive. According to Han Sang-jin (2000), in Korea, where the influence of Confucian culture is significant, individuals have a strong desire to gain knowledge and determine whether an action is right or wrong, depending on the moral values of Korean society. This means that as informatization enabled easier access to and validation of various information, the Korean government's informatization policy was highly accepted by Koreans.

Table 1-18 | Achievements in Informatization among Companies and Individuals

	1999		2004	Growth Rate (%)
Number of Internet banking users	1.23 million (1999)	➡	24.27 million (2004)	1,873
Online stock trading	KRW11 trillion (1998)		KRW37 trillion (2004)	236
E-commerce volume	KRW58 trillion (2000)		KRW314 trillion (2004)	417

Source: Oh Gwang-seok (2005).

Policy directions that played a decisive role in successfully digitizing all Koreans are as follows: When ICT devices are first introduced, an 'access divide' exists between those who can access the devices and those who cannot. Then, when ICT devices are used by more people, a 'usage divide' can emerge between those who know how to use the devices and those who don't. As such, Korea's informatization policies were specifically targeted at expanding universal access and utilization of information. Therefore, efforts must be made to create an environment where anyone can access the Internet and no one is excluded from the opportunity to have ICT devices due to income, geography, age, educational background or disabilities, and relevant education must be accompanied to ensure that as many people as possible can raise their skills to use information.

For a successful execution of Internet education for all population, great attention needs to be paid to ensure free access to information products and services and improve skills of using information, and relevant initiatives need to be executed to achieve the goals.

Table 1-19 | Policy Goals and Strategies for Internet Education for All

	Phase 1: Ensure free access	Phase 2: Raise information utilization competency
Goal	Realize a universally accessible Internet environment	Improve skills to use information through Internet education
Initiatives	• Expand broadband network availability to islands and remote areas • Assist with distribution of PCs and free facilities for the disadvantaged • Assist with content development and assistive devices	• Customized education to expand informatization among the disadvantaged • Strengthen informatization education infrastructure
Responsibility	Government-private collaboration	Government-private collaboration

- **Universal access through the establishment of information infrastructure**

To facilitate Internet education for the entire population, it is important to create an environment where Internet access is available anywhere. Extra attention must be paid to people living in rural areas, low-income households and people with disabilities who, unlike the general public, have the poorest access to information by providing necessary broadband availability and information technology products such as PCs and public information access facilities.

In Korea, the construction of fiber-optic cables connecting 144 major cities across the nation was completed in December 2000, enabling people living in areas as small as Eup and Myeon communities to access broadband Internet. At the same time, information access facilities were set up in public places like Dong offices and post offices to provide free Internet access at all Eup and Myeon communities. To assist rural communities in obtaining access to information, the Ministry of Government Administration and Home Affairs has set up information network villages since 2001, and the Ministry of Maritime Affairs and Fisheries opened fishing village reception rooms at exemplary fishing villages nationwide.

In addition, Internet services were provided to elementary, middle and high schools at free or low cost, and PC lease and Internet communications expense were subsidized for children in low-income households. Used PCs were distributed to people with disabilities, welfare facilities and rural communities.

Besides these efforts, online content was developed for people with disabilities, senior citizens and other vulnerable groups. Especially for people with disabilities, screen readers, braille terminals, and other assistive information products have been provided since 2003.

Table 1-20 | Content Produced for People with Disabilities and Senior Citizens (2002)

Area	Content
Public	Information on transport facilities, amenities and laws and policies
People with Disabilities	Self-diagnosis of disorders, housing for the disabled, welfare facilities for the disabled, rehabilitation training, movies and books, vocational training, academic materials, products for the disabled, leisure and sports
Senior Citizens	Alzheimer's disease, lifelong education, silver health, academic materials, leisure and sports for senior citizens, welfare facilities for senior citizens, products for senior citizens, nursing information

Source: Information Cultural Center(2003).

● Promotion of information utilization through informatization education

In addition to free access to information, improvement in the ability to utilize information is also needed. The Korean government pushed ahead with extensive programs to get all its citizens to receive Internet education while enhancing informatization education for the information-underprivileged, including 2 million housewives, people with disabilities, farmers, fishermen and senior citizens. The Digital Literacy Plan for 10 Million 2000-2002 set in motion in 2000 as a joint effort of 10 government ministries, and the Phase 2 Digital Literacy Plan 2002-2004 developed with more emphasis on practical education resulted in a rapid increase in the use of the Internet by the public. Such an impressive outcome should be attributed to the government's systematic and coordinated effort and its strong leadership to establish and execute nationwide informatization initiatives. Even after the informatization education for 10 million achieved its goal earlier than its scheduled deadline, the government went on to further diffuse informatization by providing on-site education, online education and other customized programs for the information-underprivileged such as people with disabilities and senior citizens.

● Facilitation of nationwide informatization through public-private collaboration

Nationwide informatization is important for society and the economy as a whole, and thus requires collaboration, rather than the government's single engagement, among government ministries, public organizations, non-profit organizations and the private sector to optimize the effect. In this collaborative landscape, the government's role should be developing policies to tackle the digital divide, establishing legal and institutional framework to support the policies, assisting public and non-profit organizations with their initiatives for reducing the digital gap, and encouraging the participation of private-sector firms in the associated efforts.

Public organizations need to take part in the provision of various services needed to access information, provision of informatization education, distribution of PCs and other telecommunications terminals, operation of information facilities and supply of content for the disadvantaged groups of people.

Finally, the private-sector firms need to directly participate in the informatization effort with the construction of information and communications network in rural areas, development of products and technologies for access to information by people with disabilities, or development of convenient ICT products, or they can collaborate with public organizations in the distribution of ICT devices, provision of volunteer services or assistance for non-profit organization.

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Chapter 02

High-speed Internet Network Construction and Informatization Project Financing Scheme

1. Introduction
2. Domestic/International Conditions and Drivers for Policy Introduction
3. Policy Implementation Strategy
4. Implementation of the High-speed Internet Infrastructure
5. Management of the Informatization Promotion Fund
6. Policy Achievements
7. Policy Implications

Chapter 02

High-speed Internet Network Construction and Informatization Project Financing Scheme

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<Summary>

With information communication becoming the key driver of national competitiveness from the 1990s, Korea also began to see the need to develop its own ICT growth strategy as well as a new investment plan to become a world leading economy in information age of the 21st century. More specifically, the need for a new strategy for implementing a high-speed internet network was voiced by the National Assembly, research centers, corporations, and the government as a way to secure a foundation to build a new, powerful economy with a small but effective government. The high-speed internet network was also seen as a way to improve the efficiency of the existing infrastructure (SOC) and secure technology independence in ICT. Such interest and support served to drive the implementation of a high-speed internet network on a nation-wide scale, led by the government. Korea's high-speed internet network project, combined with an appropriate competition policy, resulted in the construction of a world class broadband infrastructure. The government directly invested in building broadband network for the public sector, and induced facility-based competition in building broadband network for the private sector. Although facility-based competition results in weak economic efficiency due to overlapping investments unlike service-based competition, it has the advantage of accelerating infrastructure buildup by making companies compete with each other for investment. Under the facility-based competition environment, late entrants aggressively invested, which led to an early establishment of the ICT infrastructure and a rapid expansion of subscriber base. This created a virtuous circle in which service providers who gained economies of scale lowered rates, winning more subscribers. The informatization promotion fund played a big role in enabling the government to drive such a policy. The fund, aimed specifically at nurturing the ICT industry, was set up by collecting contributions from the ICT firms through the selection of

new telecom operators, and was tremendously instrumental in enabling the government to intensively invest in the ICT initiatives with a long-term vision.

1. Introduction

Since the 1990s, the global economy has entered a truly new era in which new IT industries and an IT-driven culture were created following the revolutionary development of IT technologies and the progress of information society. The advanced countries such as the U.S., Japan and the EU nations understood that IT was a critical element of the nation's competitiveness and fiercely strived to define and carry out IT plans to build high-speed and broadband communication networks in order to take the initiative in the information society of the 21st century. Amid this trend, Korea realized the need for strategies to develop its IT industry and finance relevant projects to be a leading IT nation in the 21st century. To this end, the National Assembly, research institutes, the corporate sector and the government agreed on the need to build a high-speed communication infrastructure to improve the efficiency of the existing infrastructure and secure the IT industry's technical competitiveness so that we can build a small but powerful government and a nationwide IT network to enrich every aspect of Korean society.

Under these circumstances, the Korean government started developing a master plan for a high-speed information network in 1993, including an analysis of the IT environment. The government announced the Master Plan for High-speed Communication Network in March 1994 and set up a high-speed communication network implementation committee in May in accordance with the Rule on High-speed Communication Network Implementation Committee (Executive Order 14275). In August of the same year, the Korea Information Infrastructure Task Force was set up and the planning activities were accelerated. The final Master Plan was completed and published in March 1995 after several public hearings. The Master Plan defined the first objective to build the Information Superhighway by 2015 that would deliver different types of information such as voice, data and video in real time, with a total of 44 trillion KRW in investment, so that Korea would be a part of the second leading group of IT countries following the U.S. and Japan.

The high-speed communication infrastructure project was conducted over three phases. During the first phase (1995 - 1997) of building basic networks, optical transport networks were laid down over 80 areas throughout the nation and ATM pilot switching networks were constructed. During the second phase (1998 - 2000), designed to complete the communication networks, commercial ATM networks were built and optical delivery networks were also

installed over all the country's telecommunication zones (a total of 144 zones). The second phase was originally scheduled to finish in 2002, but the completion date was moved up by two years to actively respond to an explosive growth in Internet users and to prepare the core infrastructure required to secure Korea's competitiveness as soon as possible. The third phase was also moved up and shortened from 2003 - 2010 to 2001 - 2005.

2. Domestic/International Conditions and Drivers for Policy Introduction

2.1. Informatization of Advanced Economies in the 1990s

Since the 1990s, innovation in ICT and progress in informatization led to unprecedented waves of change for the global economy such as creation of new industries based on ICT and a new culture of utilizing information and communication. These trends signaled the beginning of the information society where information and communications became the base for national competitiveness.

Industrialized economies including the U.S., Japan, and the EU competed against each other in upgrading their information communications networks to high-speed broadband to emerge as the leader of the 21st information society. High-speed broadband network deployment plans were devised to offer services like e-newspapers, e-magazines, films, games, home shopping, home banking, telecommuting, and telemedicine. They were delivered as multimedia service via high-speed broadband networks to the home (FTTH, Fiber To The Home) and to the office (FTTO, Fiber To The Office). Such networks were also recognized as a new component of SOC (Social Overhead Capital) that can drive a nation's growth in the era of unlimited competition.

The U.S. built NII (National Information Infrastructure) to secure leadership for the 21st century by strengthening its national competitive edge by driving ICT advancement and innovation. Voice-based communications networks were upgraded to ISH (Information Super Highway) where voice, video, and data converge. The NII vision also included restructuring and reengineering of businesses. NII ultimately aimed to reinforce national competitiveness and became an important ideology as well as policy for the government and businesses.

Building ISH was focused more on linking existing telephone, cable TV, and data networks into one rather than on creating new ICT networks. The aim was to leverage ISH as a nationwide telecommunications network and open the ICT market to promote growth of the

ICT industry and to increase its competitive edge.

Japan focused on using high-speed ICT network deployment as a way to drive the growth of related industries. After capital and technological expertise accumulated in the 1980s failed to find the right investment destination and signs of slowing economic growth became evident, Japan identified the high-speed ICT network as the needed stimulus to revive the depressed economy and to create jobs. The Ministry of Post and Telecommunication defined the next generation communications network as a new component of SOC to be differentiated from existing components like roads, ports, and airports and sought to build an optical cable network that could deliver nationwide B-ISDN service. It also planned to concurrently invest in the optical industry - expected to emerge as the core industry of the future - to secure competitiveness to become the world leader of the future.

The EU saw building the high-speed ICT network as the solution to reclaim the glory of the past European civilization by recovering the social and economic leadership it had lost to the new industrial powers like the U.S. and Japan after the Second World War. As an investment plan to prepare for the coming information society, the EU wanted to leverage multimedia ICT service in building the welfare state. Under the leadership of public telecommunications service providers, it started to upgrade ICT networks into high-speed broadband networks and support the growth of related industries.

2.2. Informatization of Korea in the 1990s

2.2.1. Overview

Korea's efforts for wider penetration of data communications started back in the early 1980s. In August 1981, Korea unveiled a plan to increase the penetration of data communications, and in March 1982, Korea Data Communications Co., Ltd was established as the first company in Korea dedicated to data communications service. To facilitate the growth and availability of different types of data communications service with establishment of this company, the government opened the PSTN (public switched telephone network) in March 1983 to enable direct connection to PSTN for modems, facsimile machines, card readers, and other types of ICT terminals and devices.

Encouraged by the success of policies to promote data service, the government activated DACOM-Net as a PSDN (public switched data network) in July 1984 and launched Chollian service, the mother of PC based communications service in May 1988. Then, in 1992, Korea Telecom (KT now) along with 12 private companies acquired KETEL, the PC based communications service of Hankuk Economic Daily, to unveil its own PC based

communications service dubbed "Hitel." In 1994, Nownuri of Nowcom also entered the market. The very active PC based communications market proved to be a solid foundation for future growth of high-speed broadband service. It secured a wide subscriber base, which facilitated the growth of ADSL and other broadband services.

Until the 1990s, Korea had the capability to develop some of the systems, but it trailed leading countries in competitiveness of core technologies and information usage in advanced fields like high performance computers, high-speed ICT devices, and multimedia. Moreover, ICT growth was led primarily by voice telephony. Korea was still very much behind in infrastructure for data communications for such purposes as creating, storing, processing, and transmitting text, video, and other multimedia information. Public information was also not stored or made available in databases, meaning there was not much of information to be distributed. ICT penetration in the industrial sector was, likewise, limited to internal systems used to handle business processes. In particular, with the Uruguay Round, NAFTA, EU1992, and other such trade arrangements, the global economy had become both globalized and regionalized. The opening of the ICT market also was one of the top priorities in the trade negotiations. This called for a new strategy that could help the country overcome the limitations of the existing growth strategy. The Korean government established a new policy objective - 'competition first, opening later' in preparation for the pressure to open the ICT market. However, as a comprehensive industrial policy covering ICT service, devices, and software, it left much to be improved.

Table 2-1 | Informatization Index by Country in 1994

	Korea	U.S.	Japan	Europe	Singapore
Average Annual Informatization Growth (1988~1994)	33.1%	29.3%	27.2%	22.4%	19.3%
1994 Informatization Index	76.58	347.59	102.27	201.78	172.74

Note: Assuming Korea's informatization level was 100 in 1995.
Source: NIA (1996).

Looking at the ICT service of Korea in the early 1990s, usage of local and long distance dial telephone services was sharply increasing, while new services like call forwarding and call waiting were being introduced. Usage of telegraphs and telegrams was declining, but faxing was proving to be very popular. There were only around 470,000 mobile service subscribers, but the number was rising rapidly.

Despite the advancements, informatization was still rather low in terms of national policy priority and accounted for only 3.8% of national GDP in total investment. Also, the national penetration of ICT, automation, or networks was low, and Korea lagged behind in overall ICT

adoption compared to other countries.

Korea's ICT penetration or informatization level in the 1990s was 20 to 30 years behind advanced economies. The ICT industry was suffering structural weaknesses, forcing the country to play catch-up not only against advanced countries, but also against competing economies like Taiwan and Singapore, except in a very few niche areas. Not one comprehensive and systematic ICT project was underway, so there was not an adequate base for gaining technology independence. R&D funding was too dependent on the government.

2.2.2. Building of the Nation's Backbone IT Infrastructure

Since computers were first introduced to the National Bureau of Statistics, the Economic Planning Board in 1967, several government agencies started to purchase computers to handle specific tasks, as required, from the late 1970's, but the full-scale government-level national computerization plan was not developed until the mid-1980's. The government's interest in informatization started with some government agencies' adoption of IT technologies as secondary tools to address small unit level tasks, but it failed to produce concrete action plans or national policies. The computerization efforts which were performed at the government agency level were expanded into national initiatives once the Law on Expansion of Public Access to IT Infrastructure and Promotion of its Utilization was enacted in 1986 and the master plan for the nation's backbone IT infrastructure was developed in 1987.

Figure 2-1 | Milestones of the Construction of the Nation's Backbone IT Infrastructure

Computerization of Government Agencies (- 1977)

- Computerize budgeting of the Economic Planning Board (1970, demonstrated to the President)
- Computerize telephone business of the Ministry of Communications (1971)
- Computerize the Korea Customers Service, the Korea Tobacco and Ginseng Corp., and other agencies (1973)

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Master Planning for Computerization of Administration (1978 - 1985)

- Improve public administrative services - Implement a small but efficient government	- Develop a master plan for the 1st phase computerization of administration (1978) - Computerize registration of automobiles and resolution of citizens' complaints about automobiles (1982) - Computerize driver's license issuance procedure (1982) - Computerize passport issuance business of the Ministry of Foreign Affairs (1983) - Develop a master plan for the 2nd phase computerization of administration (1983)

The 1st Phase Computerization of the Nation's Backbone IT Infrastructure (1987 - 1991)	
- Realize an information society to match that of advance countries by the early 2000's - Complete the construction of national backbone IT networks by the mid-1990s' - Implement a small but efficient government - Build and maintain the national competitiveness by enhancing the productivity of the corporate sector	- Master plan for IT networks of administration (1987) - Master plan for IT networks of education and research (1988) - Master plan for IT networks of financial industry (1988) - Master plan for IT networks of national defense (1988) - Master plan for IT networks of research institutes (1988) - Comprehensive plan for information society (1990) - Plan to supply multi-functional office equipments (1988)
The 2nd Phase Computerization of the Nation's Backbone IT Infrastructure (1992 - 1996)	
- Expand, complement and develop, and stably operate the nation's backbone IT networks - Grow the national IT industry	- The 2nd master plan for IT networks of administration (1992) - The 2nd master plan for IT networks of education and research organizations (1992) - The 2nd master plan for IT networks of financial industry (1992) - The 2nd master plan for IT networks of national defense (1992) - The 2nd master plan for IT networks of research institutes (1992)

Source: Oh Gwang-seok (2005).

The project to build the national IT infrastructure was conducted at the functional level: the network for administration (government and government-invested agencies), the network for financial industry (banks, insurance carriers and securities firms), the network for education and research organizations (universities and research institutes), the networks for national defense (defense-related organizations) and the network for public safety agencies (public safety-related organizations), and the Law on Expansion of Public Access to IT Infrastructure and Promotion of its Utilization was enacted in May 1986 to provide a legal ground and an institutional framework to support the implementation of the project. Especially for the project to build the network for administration, the core of the national IT infrastructure initiative, in which a total of 147.9 billion KRW was injected from 1987 to 1991, the government understood that the computerization efforts separately managed by different agencies generated technical issues such as a lack of the standards and compatibility and the benefits that they brought about were also small against investments. As a result, it adopted the Top-Down approach and the Invest First, Settle Later approach to complete the project. According to the Top-Down approach, the government defined the six areas of priority to focus on first: citizens, real estate, employment,

customers, automobile and economic statistics. The Invest First, Settle Later approach required the assigned operators to invest necessary funds first and to be settled with the government later, which was believed to be a very innovative financing technique, which effectively distributed the risks involved in the large-scale project and address the budgetary restriction of the government.

2.2.3. Implementation of Informatization Promotion Plan

Since the beginning of the 1990s, the developed countries such as the U.S., Japan, the EU nations and Singapore started pushing forward informatization as a critical strategy to determine an individual nation's competitiveness and further its survival in a global competition by raising the productivity of the government and industries as well as contributing to the growth of national economy and creating jobs. In this global trend, Korea also recognized the informatization as a key element to determine the future of the national economy and the development of the society from the mid 1990s and prepared and implemented the visions and strategies at a national level.

In its first move, the government created the MIC to replace and expand the functions of the former MOC in a governmental reorganization conducted in December 1994 and consolidated the functions distributed to multiple agencies into the MIC, such as promotion of the IT industry and development of communication and broadcasting technologies. Along with this organizational change, the government enacted the Framework Act on Informatization Promotion in August 1995 and made systematic preparations to realize the informatization, including setting up a committee to govern all informatization-related activities throughout administration, legislation and jurisdiction. In accordance with the Framework Act, the government also developed the Master Plan for Informatization Promotion. This was an upgraded version of a national informatization framework intended to further advance the existing informatization projects including the construction of the nation's core IT infrastructure. In other words, the Master Plan was a policy framework representing the government's IT policy direction in a comprehensive and systematic way and the highest level of the government's IT plan that incorporated different IT plans prepared. Unlike the 5-year Economic Development Plan in the past, the Master Plan well displays changes in the roles of the government. In fact, in developing an informatization plan at the governmental level, the government is required to provide a comprehensive and systematic long-term visions at the national level from the initial stages of the informatization so that the government itself can create the initial demand for informatization as a leading user of information technology and encourage the private sector to exert their creativity and voluntary efforts and make investment in the IT industry. The contents of the Master Plan, which were announced over different timeframes, are as follows:

The Master Plan for Informatization Promotion developed in 1996 was the government's first broad blueprint to usher in an information-based society into Korea by 2010. The Master Plan had informatization objectives that would be conducted over three phases by 2010. The objectives of the first phase (1996 - 2000), which was designed to build foundations for a rapid implementation of the informatization, were to identify and focus on ten major tasks for informatization and upgrade the level of Korea's IT industry to that of G7 countries. The first phase also included the construction of high-speed communication network to serve 30,000 government agencies and 2.6 million individual subscribers throughout the country, and the arrangement of regulatory and systematic environments. The objectives of the second phase (2001 - 2005), which was to expand the utilization of information, were to stabilize the private sector-led informatization efforts and create a sufficient demand for an advanced information society. The third phase (2006 - 2010), which was intended to further advance the utilization of information, had objectives to make information available anytime and anywhere for anyone.

Table 2-2 | Different Phases of Master Plan for Informatization Promotion

	June 1996	March 1999	April 2002	December 2003
Plan	Master Plan for Informatization Promotion	Cyber Korea 21	e-Korea Vision 2006	Broadband IT Korea Vision 2007
Period	1996 - 2000	1999 - 2002	2002 - 2006	2003 - 2007
Vision	Realize the world top class information society by 2010	Build a creative knowledge-based nation	Build a global leader of e-Korea	Build a broadband-linked IT Korea
Objective	Identify and perform the 10 core and urgent tasks with most far-reaching effects to build a foundation for an advanced information society	Utilize informatization efforts to create jobs and boost the national economy so that the nation can recover from the after effects of the 1997 financial crisis	As the key objectives of the Cyber Korea 21 initiative were accomplished earlier than scheduled, define new visions and objectives of the national level informatization efforts	Incorporate the key plans of different areas: e-Government Roadmap, BcN Master Plan and Mid- and Long-term Master Plan for Information Protection

Source: MIC & NCA(2005).

2.3. Expansion of Telecommunications Services and the ICT Equipment Sector in the 1990s

2.3.1. Expansion of Telecommunications Services

Demand for telephones was sufficiently met by the provision of additional 9,81,8000 lines between 1992 and 1999. The number of subscribers per 100 inhabitants rose from 33.7 in 1991 to 43.8 in 1999. Unlike telephone services, development of wireless communications was slow. The major reasons for the lack of development in wireless communications in the 1990s were high equipment production costs, lack of technologies, high initial cost to subscribers and the limited effectiveness. For these reasons, the mobile telephone network at the time had a mere capacity of 135,000 lines, and the share of mobile communications services and value-added services was very low, serving just 10% of the total population.

However, wireless communication technologies began to make a steady progress soon thereafter and demand for wireless communication services significantly grew around the world. As Korea was no exception to such trend, the Korean government made various efforts to promote the growth of the wireless communications market. By the end of 1999, the capacity of the mobile network grew by 86 fold from 1991 to reach 30.4 million lines, and the capacity of wireless paging also expanded by about 12 times during the same period. The number of mobile subscribers grew to the extent that 1 out of 2 Koreans had mobile phones, and CDMA (Code Division Multiple Access) and PCS (Personal Communication System) mobile phones came into the market in 1998. As of the end of 1999, the total number of mobile subscribers grew to 26.66 million, surpassing that of fixed line subscribers of 21.88 million. In addition, the successful launching of the Mugunghwa satellite opened a new era of satellite broadcasting.

2.3.2. Growth of the ICT Equipment Sector

The ICT equipment sector grew at a fast pace in the 1990s. Production output of ICT equipment increased by 3.3 times from USD 21,516 million in 1993 to USD 70,801 million in 1999. During the same period, domestic consumption grew by 3.4 times from USD 16,459 million to USD 56,465 million, and export volume expanded by 2.8 times from USD 14,363 million to USD 39,897 million. Import volume also rapidly grew by 2.8 times from USD 9,306 million in 1993 to USD 26,190 million in 1999.

As such, the share of ICT equipment exports in total exports increased to 27.8% by 1999. In 1999, export of ICT components totaled USD 26.2 billion, accounting for 65.8% of total ICT equipment exports.

As of 1999, major exported ICT products included RAM, semiconductor processing on

commission, mobile handsets, color CRTs, LCDs, CRT monitors, desktop PCs, optical disc drives, LCDs for end users and PCBs. Exports of these 10 products totaled USD 31.3 billion, comprising 78.5% of total ICT equipment exports.

The export growth for RAM was particularly high in 1999 compared to 1998, and RAM became a major export item in the 1990s. Mobile phones and LCDs were also major items exported at the time.

2.3.3. Restructuring of the Telecommunications Services Sector

As economies of scale are critical in the telecommunications services business, appropriate maintenance and control of natural monopolies are known to be the best way. With the development of economics, however, the argument that competition is also needed in the telecommunications services market became convincing. As a result, competition was partially introduced to the market through the three rounds of major restructuring of the telecommunications services sector in the 1990s. Through competition, the government aimed to boost efficiency in the provision of telecommunications services and induce introduction of new services. Introduction of partial competition is credited with giving rise to lowered rates, provision of diverse services, improved quality, and improved customer service.

Market-opening pressure in the late 1980s forced Korea to open its markets to liberalization and competition. The US designated Korea as one of its Priority Foreign Countries (PFC) and demanded additional market opening including the mobile phone market. The Korean government felt the need to reorganize the market structure to deal with such demand, and carried out the first round of market restructuring in July 1990. The restructuring included adoption of a new classification of telecommunications service providers and introduction of limited competition. Under the new classification system, telecommunications business, which had been defined simply as 'public communications business' in the past, was divided into basic services and value-added services. Basic services were further classified into sub-categories, with different entry and ownership requirements imposed on each sub-category. Full competition was introduced to the value-added services sector. For the paging, cellular phone and international call services, limited competition with a duopoly system was introduced. This change allowed DACOM to enter the international call service market in December 1991. Regional service providers were selected as paging service providers in 1992, and Shinsegi Telecom was selected as the third cellular service provider in 1994. Despite the government's effort to restructure the telecommunications market, several drawbacks emerged, including limitations of introducing new services, a difficulty in classifying combined wire-wireless technologies, and side effects of the duopoly system.

The second round of restructuring was carried out with the completion of the Uruguay

Round at the end of 1993, beginning of the WTO's Negotiation Group on Basic Telecommunications (NGBT) talks in April 1994 and other events that reshaped the global trade order. In the second round of restructuring, laws were revised to i) ease regulations on business boundaries to facilitate business diversification and commercialization of new services, ii) improve service quality, iii) expand participation in the telecommunications market through the introduction of competition, iv) ensure management autonomy through eased regulations, and v) provide users of telecommunications services with more convenience. Under the second round of the restructuring plan, DACOM was selected as the second long-distance service provider in March 1995, and new services such as personal communication services, trunked radio systems and wireless data communications were introduced. Korea Telecom was also allowed to enter other business domains, but there were still high barriers to entry due to the duopoly system in those markets and insufficient preparation of relevant regulations on competition.

The third round of restructuring was centered around "the policy to enhance competitiveness of the telecommunications business," with an eye toward promoting globalization of Korea's telecommunications, securing stability in the operation of the national backbone network, and strengthening global competitiveness of domestic service providers. To help enhance competitiveness of the Korean telecommunication providers, the Korean government allowed entry by new service providers within the boundaries of existing regulations so that they could 'first compete at home and compete globally later.' Additionally, the government tried to create favorable conditions for Korea Telecom to increase its global competitiveness and decided to establish a fair competition system to promote effective competition between dominant service providers and new entrants. In addition, the 'Framework Act on Informatization Promotion' was enacted to facilitate informatization for the nation, lay the foundation for the ICT sector, and move forward with a broadband backbone network project.

In the second stage of the third round of restructuring, relevant laws including the 'Framework Act on Telecommunications' and the 'Business Act' were amended to facilitate broad-based competition. Under the amended laws, the pre-announcement system was abolished to induce free entry to the market, and the 'preliminary license system' was introduced for future technologies to avoid delays in the development or introduction of technologies. In addition, the permit system for service rates was changed and a number of regulations were revised to facilitate competition. To ensure fair competition, functions of the Communications Commission were reinforced. By 1997, artificial barriers to entry were removed, exposing the ICT sector to full and open competition. Furthermore, with the signing of the World Trade Organization Agreement on Basic Telecommunications in February 1997, under which Korea would eventually fully open its telecommunications market, Korea's telecommunications industry was set to take a new dramatic turn.

2.3.4. Introduction of Competition

In March 1997, the Korean government announced "guidelines on the application for common carrier license and qualifications" and began to wrap up its effort to introduce competition to the telecommunications market, which it had started in 1995. As such, the restructuring of the telecommunications sector was completed with the conclusion of the WTO Agreement on Basic Telecommunications in 1998. New operators for local service, long-distance service, leasing of dedicated lines, trunked radio system service (for alienated regions) and paging service were given licenses in June 1997. Full-fledged competition was now in place across all domains of telecommunications services with the selection of nine new service providers, including Hanaro Telecom for local service and Onse Telecom for long-distance service. To accommodate the results of the WTO Agreement on Basic Telecommunications, the government made efforts to remove barriers to entry and allow foreign telecom operators to provide telecommunications services in Korea only if they partnered with the Korean companies. As a result, the total number of common carriers providing basic telecommunications services became 37, two operators provided local services, and more than 3 operators competed in other areas of telecommunications services, thereby laying the groundwork to provide better services to the general public as well as prepare Korea to its open markets under the WTO regime.

If the focus of the 1980s was on fulfilling basic demand for ICT in Korea, the focus of the 1990s was on seeking structural changes in the ICT market and introducing competition. In particular, various efforts made by the government to promote competition and restructure the telecommunications market with the opening of the ICT market scheduled in 1998 generated positive results. DACOM snatched up a 20.7% market share by the end of 1992, just one year after it entered the international call service market, and Onse Telecom also managed to increase its market share to about 13% by the end of 1999 in just three years after its market entry. Meanwhile, Hanaro Telecom, which started local service, attracted 400,000 subscribers to its broadband Internet service by early 2000, and Onse Telecom, since its launching of long-distance service, also gained a firm footing as the third long-distance operator by securing 323,000 subscribers by December 1999. In the mobile phone market, a duopoly system was created with the entry by Shinsegi Telecom in 1994, but the competition grew fierce when 3 additional PCS operators entered the market in 1997. The rapid growth in the mobile phone market was largely attributed to the introduction of competition to the market. Introduction of competition resulted in raising the well-being of users as well as the customer-oriented attitude among operators and contributed to making the market more mature. Entry by foreign competitors was naturally contained. Most positive benefits were seen in lowered rates driven by competition, provision of diverse services, improved quality and improved customer service.

Introduction of competition to the telecommunications market brought big changes,

especially cheaper rates and more choices of rate plans. These changes were particularly noticeable in mobile phone and paging. The paging and mobile phone service markets monopolized by SK Telecom entered a rate-cutting war when new operators entered the paging market in 1992 and other operators entered the mobile phone service market in 1996. The rate-cutting war in the mobile phone service market was accelerated when PCS operators also entered the market in October 1997. Such competition not only led to lowered charges but also provided more choices of rate plans for consumers. After competition was introduced, international call charges fell by about 51% and long-distance call charges were reduced by about 36%. Various rate plans were offered, giving consumer more choices.

With the telecommunications market exposed to full competition, changes began to emerge in the fixed-line and wireless service markets. This means, if users are offered cheaper rates for mobile services, their dependence on fixed-line service will decrease. Also, as consumers were given more choices with the introduction of new and diverse services, changes in the management practices of operators were needed. Because new services tend to replace or supplement existing ones, operators had to improve service quality, and offer more diverse value-added services.

2.4. Background for High-speed Internet Infrastructure Implementation

With information communication becoming the key driver of national competitiveness from the 1990s, Korea also began to see the need to develop its own ICT growth strategy as well as a new investment plan to become a world leading economy of the 21st century information society. More specifically, the need for a new strategy for implementing high-speed ICT network was voiced at the National Assembly, research centers, corporations, and the government as a way to secure a foundation to build a new, powerful economy with a small but effective government. The high-speed ICT network was also seen as a way to improve the efficiency of the existing infrastructure (SOC) and secure technology independence in ICT. Such interest and support served to drive high-speed ICT network implementation as a nationwide project sponsored by the government.

The government's IT policy devoted itself to meet the basic demand of telecommunication and prepare foundations for an information society until the mid 1980's. Since then the government made an intensive focus on growing the IT industry at the national level with the slogan 'We were late in industrialization. But we will lead the information age' until the mid 1990's. Then it established the Ministry of Information and Communication (MIC) and devised a variety of plans to promote the industry as a main engine for the national economic growth. This strategy was strengthened and more investment was made into the IT sector at the end of

1997 when Korea became subject to the supervision of the International Monetary Fund (IMF) after the country was hit hard by the global financial crises. Major IT-oriented projects were carried out with budgets from the Information Promotion Fund: informatization, an IT technology development and a comprehensive development plan for the IT industry, and the IT industry truly became the main engine for the nation's economic growth.

In accordance with the government reorganization act passed by the National Assembly on December 23, 1994, the Ministry of Communications that governed the national telecommunication policies was changed and expanded into the Ministry of Information and Communication (MIC). The reorganization was made to allow a single agency to be responsible for separately-handled IT functions and policies and build a more systematic foundation for the IT industry to grow as one of the nation's strategic industries.

The development of the IT sector requires the consistent and consolidated development of different areas: equipment, software and communication network. Up to that point, however, different government agencies had supervised the different areas: equipment by the Ministry of Commerce, Industry and Energy (MCIE), software by the Ministry of Science and Technology (MST) and communication network by the Ministry of Communications (MOC), which resulted in many duplicate and wasteful tasks and policies. As a result, when the government's reshuffling was implemented in December 1994, many IT functions of different agencies were transferred to a single agency, the MIC: the MCIE's functions to foster and support the IT industry, telecommunication equipment industries, multi-media and computers and peripherals industries; the MST's functions to develop and nurture the system development industry, develop and distribute computer systems and protect and develop computer programs; the Ministry of Information's cable broadcasting-related tasks and permission issuance for cable television operators. As a result, the MIC was positioned to make an accurate analysis of the level of the nation's informatization and the status of the IT industry and better support different IT industries in a more comprehensive and consistent way so that they were able to more flexibly respond to changes at home and abroad.

The Ministry's successful implementation of those challenging functions was largely attributed to the Information and Communication Promotion Fund. The Fund was set up with the idea that the fund collected from IT operators through different governmental processes, including a new telecommunication operator selection process, need to be invested into the IT industry again and served as the valuable financial source for the government's active investment in IT research and development projects. The Fund enabled the MIC to successfully launch the CDMA and IMT-2000 services and build the world's top class IT infrastructure and make enormous contributions to expediting the IT industry's advancement and enhancing the benefits citizens enjoyed in their daily lives.

3. Policy Implementation Strategy

The high-speed ICT infrastructure project was efficiently carried out based on the following implementation strategies:

First, the undertaking was divided into the high-speed research network (KOREN, the Korea Advanced Research Network), the national high-speed network (KII-G), and the high-speed public network (KII-P) projects, which were to be organically linked with each other. The government was responsible for implementing the national high-speed network and research network, while the private sector was in charge of building the high-speed public network. The high-speed research network, or KOREN, was an information communication network to serve as a test bed for developing application services and core technologies. Services and technologies developed through KOREN were then to be adopted on the national high-speed network. This network was priced affordably for the usage of key groups responsible for enhancing national competitiveness such as public institutions, research centers, and universities. The network was to be built with public investment until 2010 as a state-of-the-art high-speed broadband network and was to create the initial demand to facilitate penetration of the high-speed public network. The high-speed public network refers to the high-speed ICT network built by telecommunications service providers based on the accumulated technology and experience garnered from the national high-speed network to offer ICT service to the general public.

Second, the high-speed ICT infrastructure project was implemented in three stages from 1995 to 2015 to accommodate any changes in the ICT environment. In the first phase (1995-1997), a 2.5Gbps or higher grade optical transmission network was to be built between Seoul and Daejon with its own ATM switches as part of the high-speed research network KOREN. In the second (1998-2002) and third (2002-2010) phases, the network was to be continually upgraded to the maximum speed possible. The national high-speed network aimed to deploy high-speed network infrastructure in the first phase (1995-1997) to offer a 2.5Gbps backbone network and 45Mbps ICT service. In phase 2 (1998-2002), the backbone network speed was to be upgraded to dozens of Gbps to support 155Gbps ICT service. The national high-speed network was to be completed in phase 3 (2003-2010). The high-speed public network aimed to create the infrastructure in the first phase (1995-1997), expand it in the second (1998-2002), and complete it in the third phase (2003-2015).

Third, the Korean government initiated a wide range of pilot projects to increase public awareness and usage of the high-speed ICT infrastructure for the future information society. Applicable laws and regulations were also to be continually updated. The implementation roadmap focused on leveraging the creativity and dynamism of the private sector coupled with

efficient usage of national telecommunications resources like cable TV and idle, privately-owned ICT facilities.

3.1. Increasing Public Awareness

As a public project where both the cost and benefit were to be shared by the public, building public consensus and engagement became prerequisite in the policy-making process for the national high-speed network project (KII-G). The government therefore launched a number of campaigns and events to increase public awareness of informatization efforts. For example, it organized special events for the "Month of Information Culture" starting from 1988. With the increasing need to raise public awareness of the significance and appropriateness of the national high-speed network policy, the government designated the Korea Information Culture Service Agency as the official PR channel for the policy. The priority in PR was also defined for public awareness campaigns of each phase. Focus was initially on increasing awareness of the importance of ICT. Different events were organized and press releases were issued to highlight the importance of informatization and to further understanding of the information society. Such efforts proved successful. Public interest in informatization rose steadily and people became more aware of ICT policies. For example, public awareness of high-speed ICT was 35.9% in 1994 when the policy was first adopted, but it rose to 50.0% by 1996 when the policy began to be implemented. The percentage rose to 63.0% by 1997 at the end of phase 1 of the national high-speed network implementation.

Such high interest was based on the recognition that the high-speed ICT network would be one of the most important components of SOC, and because informatization including the construction of the ICT infrastructure became the top priority of national policy, public interest rose thanks to the various public awareness campaigns. In other words, the information culture became a prevalent theme and building the ICT infrastructure became recognized as the most important undertaking in informatization policy.

The media's interest in the national high-speed network policy also increased. More specifically, it drew attention from the National Assembly and the press as policy execution meant higher budget allocation and higher policy priority. This also amplified interest in the national high-speed network project. Ultimately, interest from the media made policies on the national high-speed network a political issue, and interest from politicians including the National Assembly created a sort of feed-back loop that drove media interest still higher.

The government's continuing promotion of information culture and the media's rising interest in the national high-speed network resulted in higher public awareness of and engagement on informatization. It was against this background that the Framework Act on

Informatization Promotion came into force in 1995. The national basic plan could now be formulated and efforts to develop policies to create a foundation for the ICT industry and advancement of the ICT infrastructure gained momentum.

3.2. Developing ICT Professionals

Along with the increasing public awareness of informatization, developing ICT professionals was essential for the success of national high-speed network deployment. At the time, the rapid ICT market expansion and accelerated growth of the ICT industry drove demand for ICT professionals in Korea.

Developing ICT professionals required by the industry naturally became an immediate challenge for the nation to ensure the continued growth of the ICT industry - the future growth driver of the Korean economy. It was also evident that the supply of ICT professionals would become a key means to accelerate informatization of traditional industries. The government therefore made education of ICT professionals a top national agenda. Related university facilities and R&D support were reinforced, and more PCs were given to elementary, middle, and high schools to support IT education.

The government's professional training program aimed to eliminate mismatches in supply and demand in the ICT sector. To this end, strengthening field training/work of ICT resources; building expertise through global education and training programs; supporting training of high-end ICT researchers in potential high-growth areas; expanding infrastructure for analyzing HR statistics; and expanded delivery of market information were adopted as detailed policy objectives.

IT quickly grew as the new core growth driver for the Korean economy after 1997. Experts even predicted that Korea could achieve a second high-growth phase during the economic recovery if the country were successful in increasing its growth potential by leveraging the increased demand created through efforts to develop basic technology and convergence of IT with traditional industries. Advanced economies had already staked their futures in securing top ICT talents to drive future growth – even going as far as revising their immigration laws to attract foreign talents in fields of science and technology where domestic supply was short. Overall, IT's influence across industries was rising quickly at home and abroad and emerged as the key factor in determining the competitiveness of even traditional brick and mortar industries.

Against such backdrop, the Korean government announced a comprehensive plan to develop ICT professionals in November 2001. The plan aimed to develop talents for four areas:

basic technology, high-end professionals, industrial manpower, and potential talent. Details included expanding the talent pool, strengthening field training, expanding opportunities for overseas education, utilizing foreign talents, creating an R&D environment, identifying and developing young IT talents, and developing researchers for basic science and interdisciplinary research.

As a result, investment for ICT resource development began to rise steadily in 1997 and reached over 1 trillion won annually from 1998 to 2003.

3.3. Streamlining the Legal and Regulatory Regime

Having the right regulatory framework is another essential prerequisite to enter the 21st century information society. In the 1980s, government entities began to adopt IT systems, so ministries and departments were busy preparing or revising laws and regulations on informatization. The Ministry of Information and Communications (then the Ministry of Post) promulgated the Act on Increasing Computer Network Deployment and Usage (1986) and Act on ICT Research and Development (1991). The Ministry of Commerce, Industry and Energy (then the Ministry of Commerce and Industry) adopted Act for Trade Process Automation in 1991 to promote usage of EDI (Electronic Data Interchange) in trade.

However, if Korea were to emerge as the leader in the 21st century information society, support from a new, more integrated regulatory framework was required. It was in recognition of such need that the government started to shift away from the 'industrial society' oriented regulatory regime toward one that was more appropriate for the 'information society.' As a result, the Framework Act on Informatization Promotion went into effect in August 4, 1995 after passing the National Assembly on July 15, 1995.

The Framework Act on Informatization Promotion set the overall direction of Korea's informatization efforts such as wider adoption of ICT, creating the ICT industry base, and building a more sophisticated ICT infrastructure. It also laid out the basic legal foundation for implementing such measures. At the same time, the Act created the framework for streamlining and structuring laws and regulations on information production, distribution, and usage.

The Framework Act on Informatization Promotion can be seen as the central piece of legislation on informatization in Korea, and it laid the cornerstone for structured execution of national informatization policies. The Act was the first to specify support for ICT industry growth on par with that for the manufacturing sector. It also devoted a whole new chapter on regulation of the high-speed ICT infrastructure to ensure that efforts for ICT infrastructure implementation could proceed in a consistent and effective manner as a nationwide endeavor.

The government is specifically mandated to develop a basic plan to promote deployment and usage of the high-speed ICT infrastructure along with necessary policy measures. It also gives the government the authority to designate and run an entity dedicated to effective undertaking of the above. The Act also laid out standards for managing the national high-speed network and allowed organizations with their own telecommunications networks, public infrastructure, cables, or common ducts to rent out and/or offer facilities or equipment when deemed necessary for building the high-speed ICT network. This opened the door for private players to actively participate in the efforts to build ICT infrastructure. The law also clearly stipulates the source and usage of the Informatization Promotion Fund to ensure that efforts for building the infrastructure and promoting usage would be adequately funded.

The Task Force for High-speed ICT Network started the efforts to streamline the legal and regulatory regime in 1995 and designated KISDI (Korea Information Society Development Institute) as the body for research and investigation. It also used an expert group consisting of academics, researchers, industry representatives, and working-level officials of involved ministries and agencies to identify laws and regulations to be revised or enacted for the purpose of promoting informatization.

Such concerted efforts resulted in classifying requirements for revision or enactment into three categories: promoting information usage in the public administration, economy, education, and medical sectors; preventing side-effects; and creating a common overall legal rational. In 1995, research and investigations were conducted for 14 detailed segments in eight areas with the result that 290 laws and regulations were streamlined by May 2005.

3.4. Strengthening International Partnership for Informatization

While creating the environmental and regulatory framework for national informatization with 1) increasing public awareness on informatization, 2) promoting growth of ICT professionals, and 3) streamlining applicable laws and regulations, the Korean government also began to look outward to become more active in the international partnership with regard to informatization. Already, many industrialized nations were using the OECD, G7, and other international fora to share experience and information on informatization for more efficient execution. The Korean government also stepped up its international cooperation to promote the informatization of Korea and to keep abreast of international trends and incorporate important changes into the informatization efforts of Korea.

3.4.1. International Partnership for High-speed ICT (APII Testbed)

Efforts for strengthening international cooperation by the Korean government were

crystallized as international projects for high-speed ICT deployment. Since 1995, Korea has been the leader of the APII Testbed project, which linked research networks of the Asia-Pacific via APEC (Asia-Pacific Economic Cooperation). The project aimed to solidify Korea's cooperative partnership with Asia-Pacific countries and to help Korean companies make successful forays into overseas markets.

Areas for cooperation in the APII Testbed project can be divided into five areas: 1) information communications technology, 2) information communications network, 3) information contents and application, 4) HR development, and 5) regulations and policies. The project established plans for building an advanced telecommunications infrastructure for individual APEC member economies on the principle of private sector participation and introduction of free competition with consideration to the creativity and uniqueness of members, and division of roles in line with the development level and gap among member economies.

The APII Testbed project also aimed to build an APEC wide information superhighway to integrate it into GII (Global Information Infrastructure) to realize the global information society.

This project facilitated network advancement including speed upgrade of the Testbed among major countries as well as improvement of the operation structure. The research network consultation body was also formed to build a regional network from Asia to the Pacific. The project also helped to identify and undertake AP-wide projects to further facilitate network usage.

3.4.2. Participation in the G7 Information Society Pilot Project

Korea became an active member of the G7 Information Society Pilot Project to realize the global information society. With growing recognition of the need for a global ICT infrastructure, the G7 information and communication ministerial meeting held in Brussels in February 1995 agreed on 11 pilot projects for the information society. These projects aimed to verify feasibility and facilitate efforts to realize the information society by undertaking various pilot projects. The 11 G7 pilot projects were: 1) Global Inventory for creating a global inventory of information for the information society, 2) Global Interoperability for Broadband Networks, 3) Cross-cultural Education and Training, 4) Electronic Libraries, 5) Electronic Museums and Libraries, 6) Environment and Natural Resource Management, 7) Global Emergency Management, 8) Global Healthcare Applications, 9) Government Online, 10) Global Marketplace for SMEs, and 11) Maritime Information System. The pilot projects had been started by the G7 members but quickly spread to other countries around the world.

Above all, Korea focused on international partnerships that called for active participation at home and abroad. One of them involved building country-to-country optical cable networks. The first international cable network was between Korea and Japan and opened in 1980. It used analog coaxial cable. Service ended in 1997 as digital fiber optic cable introduced in the late 1980s became the norm. The second international optical cable network connected Korea, Japan, and Hong Kong and opened in 1990 to start the era of fiber optic cable. Efforts to build a worldwide submarine optical cable network started to meet the growing need for international communication and to ensure Korea's place as the hub of international communication through route diversification. Korea laid a submarine optical cable between Korea and the U.S. in 1999 to secure a direct submarine optical cable link to North America and also participated in the construction of the Eurasia submarine optical cable network. Since then Korea also took part in construction of the FLAG submarine cable network linking 13 countries of Asia, the Middle East, and Europe as well as the SEA-ME-WE3 optical cable network construction for connection to 33 countries in Asia, the Middle East, and Europe. Korea has maintained a constant presence in international cooperation for global informatization.

4. Implementation of the High-speed Internet Infrastructure

By the 1990s, the leading industrialized countries began to focus on building the high-speed ICT network as it was regarded as an essential component of the infrastructure for economic growth in the age of the information society. In sync with this global trend, Korea developed the Comprehensive Plan for Implementation of High-speed ICT Infrastructure in 1994 to become a leader in ICT and executed the plan for building and upgrading the high-speed ICT network in three stages from 1995 to 2005.

In the first phase of establishing the telecommunications network infrastructure (1995~1997), 80 optical transmission networks were deployed at 80 locations around the country and a test ATM exchange was set up. In the second phase, when the telecommunications network was completed (1998~2000), the ATM commercial network was deployed and construction of optical transmission networks was completed for all call coverage zones (144 locations). This was originally planned to be completed in 2002, but due to the explosive growth in the number of Internet users and as an effort to secure a core base for national competitiveness at the earliest stage possible, the schedule was accelerated by two years to have a nationwide backbone network as soon as possible.

Hence, the third phase timeline (originally set for 2003 to 2010) was advanced to 2001 to 2005, and committed efforts were undertaken to create the world best class ICT environment.

The third phase focused on advancing the high-speed ICT network and with completion of the high-speed ICT network in 2005, anyone could enjoy a full range multimedia service ranging from voice, data, to video anytime and anywhere around the country through high-speed connection.

Korea's efforts to build the high-speed ICT infrastructure can be largely divided into efforts for building the national high-speed network (KII-G), the high-speed public network (KII-P), and the high-speed research network (KOREN).

The national high-speed network or KII-G is the backbone network built with public investment. It aimed to connect major cities and small to medium-sized cities around the country via ATM switching based optical cable to deliver high-speed connection to public institutions including central and local government agencies, schools, and research centers at affordable prices. The high-speed public network or KII-P can transmit a high volume of information at high-speed around the country and was built with funding by the private operators. It aimed to deliver universal high-speed connection in the private sector to both businesses and homes. The high-speed research network or KOREN aimed to verify the validity and appropriateness of high-speed ICT prior to commercial deployment to be used as the testbed for the latest advanced telecommunications services.

Table 2-3 | Evolution of Comprehensive Plan for Implementation of High-speed Communication Infrastructure

Description	Background	Project Timeline	Remark
Comprehensive plan for building high-speed communication infrastructure (March 1995)	• Build the Information Superhighway by 2015	• Phase 1: 1995-1997 • Phase 2: 1998-2002 • Phase 3: 2003-2015	-
Plan to advance IT infrastructure (September 1997)	• Advance the due date of the plan by 5 years to catch up with the trend of the advanced countries and prepare for the unlimited competition of the information society	• Phase 1: Completed • Phase 2: 1998-2002 • Phase 3: 2003-2010	• Phase 1 of the high-speed communication infrastructure project was completed in December 1997. • A plan was prepared to conduct phase 2 of the high-speed communication infrastructure project in May 1998. • Phase 2 was finished in December 2002.

Description	Background	Project Timeline	Remark
Master plan to enhance the high-speed communication infrastructure (May 2001)	• Completed the build-up of a nationwide, optical cable-based high-speed communication infrastructure by the end of 2000 • Announced an earlier completion of the high-speed network in January 2000 (the President's New Year's address)	• Phase 1: Completed • Phase 2: 1998-2000 • Phase 3: 2001-2005	• A plan was developed to further enhance the high-speed communication infrastructure in January 2002 ※ The earlier completion of phase 2 also advanced and shortened the timeline of phase 3.

Source: NCA (2005).

Table 2-4 | Phased Objectives and Strategies for Implementation and Advancement of High-speed Communication Infrastructure

	Build a foundation for high-speed communication infrastructure: Phase 1 (1995 - 1997)	Highly develop telecommunication infrastructure: Phase 2 (1998 - 2000)	Highly develop high-speed communication infrastructure: Phase 3 (2001 - 2005)
Objective	- Build the Information Superhighway by 2015 to deliver different forms of information such as voice, data and video in order to proactively expand the national infrastructure in preparation for the 21st century - Implement a universal IT service by building high-speed, large-sized data delivery network throughout the nation - Develop the multi-media information industry based on the high-speed communication infrastructure to create more jobs and strengthen the IT industry's international competitiveness	- Expand and further develop the IT infrastructure that plays key roles in efficiently managing the mechanism by which a society is operated, and facilitating the construction of network and the consolidation of different components of a society - For the above objectives, build high-speed communication backbone networks, and further enhance subscriber network, international network and mobile communication network	- Establish a universal service system to make multi-media services available anytime and anywhere for anybody - Provide about 84% of the whole households with 20M bps high-speed communication network service - Provide mobile communication service subscribers with maximum 2Mbps mobile communication service - Build the world top class high-speed communication infrastructure

	Build a foundation for high-speed communication infrastructure: Phase 1 (1995 - 1997)	Highly develop telecommunication infrastructure: Phase 2 (1998 - 2000)	Highly develop high-speed communication infrastructure: Phase 3 (2001 - 2005)
Strategy	- Build the High-speed Governmental Communication Network with a public fund first in order to make it available for public agencies, research institutes and universities that are critical players for the national competitiveness at low prices - Based on the operation results and technological capability of the above national infrastructure, telecommunication operators build the High-speed Public Communication Network for citizens - The corporate, academic and research sectors jointly develop 'application services' and 'core technologies' according to the implementation phases of the high-speed communication infrastructure - Carry out a variety of pilot projects and continuously modify or enact relevant legal systems to raise public awareness of information society and encourage the use of related services - Engage the private sector to exert its creativity and energy in the implementation of high-speed communication infrastructure, and efficiently utilize national telecommunication resources such as cable television networks and idle private communication facilities - Functional teams develop and perform plans to support and utilize the implementation of high-speed communication networks.	- Advance the due date of the project of the high-speed communication infrastructure from 2015 to 2010 - Conduct separate projects of backbone transmission networks and subscriber networks, and connect them - Enhance the subscriber networks based on priority - Align and expand the existing facilities according to the second phase plan to maximize the utilization of the infrastructure - Perform a phased integration of the existing basic communication network and new high-speed network - Encourage the private sector's leading role and make the plans flexible to implement	- Strengthen the government's support of policies to enable the implementation and continued advancement of the world top class high-speed communication infrastructure - Perform separate projects of different areas and effectively connect them for a more efficient implementation of the high-speed infrastructure - Collect opinions from professionals of different areas and develop a system to actively respond to changes in IT environments

Source: NCA(2005).

First, the national high-speed network project (KII-G) entailed use of public funding to build the high-speed broadband ICT network around a backbone network that can transmit high-speed, high volume data and information. The project focused on offering Internet and multimedia service at affordable prices to central and local government agencies, educational institutions, research centers, libraries, museums, and other public entities to facilitate efficient information exchange and joint usage across public entities. It also aimed to promote informatization of the public sector to enable better public civic service and higher administrative productivity. For the private sector, the network would create new demand and new investment needs and accelerate technological development efforts to enable early adoption of the nationwide high-speed ICT network.

As for the high-speed public network or KII-P, in recognition of the need for expanded high-speed Internet connection, the government began to make concerted efforts in 1998 to develop policies that were the most economic and most appropriate for the domestic conditions of the time. In line with the policy direction of the government, common carriers started in late 1999 and 2000 to aggressively invest in expansion of the broadband Internet subscriber network to create one of the world's best broadband Internet infrastructures. Thanks to such efforts, the number of broadband Internet subscribers reached 10.4 million households as of the end of December 2002, making Korea the world's leader in terms of broadband penetration. Infrastructure for broadband Internet service became available to all small towns and villages ("eup" and "myon") around the country. Korea's broadband subscriber penetration reached 17.2 per 100 population, the highest in the entire OECD.

The high-speed research network or KOREN entailed set up of 2.5Gbps KOREN in five major cities including Seoul to be available for network services like next generation Internet, which was not yet offered through commercial Internet service. Its coverage for research was continually expanded through interconnection with domestic as well as international research networks. In the beginning, focus was on development and validation of ATM-related networking technologies and applications. In phase 2, focus was switched toward research on IP based next generation Internet technologies in line with the growth in global next generation Internet based research.

4.1. Phase 1: Foundation (1995 ~ 1997)

Phase 1 of the national high-speed network was undertaken in accordance with the Implementation Plan for High-speed ICT Infrastructure established in March 1995. The goal of this umbrella plan was to expand the basic infrastructure for national ICT by proactively building the high-speed, high-capacity broadband ICT network around the nation that could transmit voice, data, video, and other types of information for the coming 21st century. Further,

to realize the set objective, detailed action plans were developed to establish the high-speed ICT infrastructure for the national high-speed network, the public network, and the research network.

The ultimate goal of phase 1 of the national high-speed network project was to build and run a broadband ICT network that connected public entities of the central and local governments via optical cables. To this end, during phase 1 from 1995 to 1997, a detailed action plan was developed and the country was divided into 144 call zones for phased deployment of communication networks.

For phase 1, government funds of 172.6 billion won were allocated in constructing the high-speed high-capacity backbone transmission network that connected over 80 locations around the country. To test and validate ATM switch performance before deployment of commercial switches, an ATM switch testbed was set up in the five major cities of Seoul, Busan, Daegu, Gwangju, and Daejon. Furthermore, activation of PUBNet (Korea National Network for Internet) offered the basic framework for delivering nationwide high-speed ICT network service to public agencies.

4.1.1. Building the Foundation for the Backbone Transmission Network

During phase 1, an optical network of 18,490 km of optical cable and 409 optical transmitters was established to link over 80 cities around the country including Seoul and Busan. This was the high-speed, high-capacity backbone transmission network.

KT by itself laid 11,667km of optical cable connecting 80 nodes and connection points in the first and second years. For more economic and stable operation of the optical transmission network, five major cities (Seoul, Busan, Daegu, Gwangju, and Daejon) were set up as full-mesh while other regions were connected by ring and point to point connections with consideration of traffic characteristics and alternative routes to ensure redundancy in equipment and optical transmission lines.

Dacom laid a total 6,823km of optical cable connecting 75 nodes and connection points from the first to third year of implementation. Key nodes and connection points were linked as a ring, while some connection points were set up as stars.

Table 2-5 | Optical Cable Laid in Phase 1 by Year (in km, nodes and connection points)

		Year 1 (1995)	Year 2 (1996)	Year 3 (1997)	Total
KT	Optical cable	6,303	5,364	-	11,667
	Transmission nodes and connection points	-	80	-	80
Dacom	Optical cable	2,130	3,228	1,465	6,823
	Transmission nodes and connection points	22	33	20	75
Total		8,433	8,592	1,465	18,490

Source: NIA(2005).

During this period, KT set up 175 optical transmitters and Dacom set up 234. As a late comer, Dacom trailed KT in telecommunications infrastructure and was therefore extended support to secure nationwide telecommunications conduits and transmission routes at more favorable conditions as a national network operator. This helped Dacom emerge as the second largest common carrier in Korea.

4.1.2. Establishment of the ATM Pilot Switch

The ATM switch was the core of overall deployment of the national high-speed network KII-G. At the time, low-speed Internet connection offered by PC communication service providers like Hitel and Chollian were popular while demand for high-speed broadband Internet connection was gradually rising. The opening of the telecommunications network by the government and policies favoring effective competition enabled more common carriers to enter long distance, local, and international telephony as well as PCS service markets. As a result, demand for leased line service rose as late comers to the market had to build their own telecommunications networks. Against this background, the disadvantages of the ATM switch - lower Internet traffic throughput, lower efficiency in IP traffic processing, and less attractive business case - compared to the router network were identified.

Still, ATM switches were chosen because, as a single network, it 1) could process not only Internet but also integrated multimedia service encompassing voice, data, and video, 2) assured higher quality over routers in multimedia transmission, and 3) made network management much more convenient for operators. Besides, by becoming one of the first to develop and deploy switch network equipment based on ATM technology - which was still in the developmental stage around the world - Korea had the ambition to secure another cutting-edge technology in IT as its own to remain the developer of TDX and CDMA switches.

As previously stated, ATM development was still in the early stage of development and ATM testbeds were built in five major cities (Seoul, Busan, Daegu, Gwangju, and Daejon) to test and verify features, performance, and service reliability of the first commercial ATM switch. More specifically, KT installed four ATM switches in Seoul, Busan, Gwangju, and Daejon while setting up an ATM connector in Daegu for subscriber connection. Dacom put three switches in the Yongsan and Gwanghwamum districts of Seoul and in Busan for pilot operation. The results showed that the installed ATM switches were still at the developmental stage and required full test verification. Much was lacking in terms of reliability and features before they could be considered full-fledged ATM switches. Follow-up measures therefore became necessary. Responsible agencies, research centers, businesses, and operators worked together to develop additional features and fine tune operation and performance. Additional network operation and service tests were also undertaken. Concurrently, engineers required for operation and maintenance of ATM switches were developed and trained, and a new organization dedicated to ATM operation was established. Technical and service training programs were also set up to ensure reliability.

KT and Dacom selected 185 organizations ranging from major public agencies to universities as sites for the ATM pilot service and conducted field surveys with 109 organizations to check the service landscape of the user organizations. The results were used in selecting 46 organizations as the participants in the first pilot service project. The sites were then provided with ATM interface units, access modules, routers, and other equipment free of charge.

The pilot ATM switch network used the network access method best suited for different on-premise communications architecture and service requirements. Each site had a private ATM network, frame relay, router, LAN, and other types of communications units set up, and devices appropriate for each environment were installed to deliver end-to-end ATM pilot service. Between switches, a full mesh type fiber optic transmission network with 155Mbps (STM-1 grade) bandwidth was set up. The outcome of the ATM pilot switch operation was used to improve the ATM switch features to be made available for the commercial service. Additional network and service reliability tests were conducted before expanded deployment of commercial ATM switches and capacity upgrades.

4.1.3. Building the Internet Network Infrastructure (PUBNet-I)

In 1994, when Internet service was not yet so pervasive, Internet service for the public sector was called KOSINet (Korea Open System Network). This was Internet service provided to only public agencies by the Ministry of Information and Communications (National Computerization Agency). KOSINet Internet service had around 100 subscribing organizations and began terminating its service in February 1998 in stages. By this time, it had fulfilled its

role of facilitating Internet penetration at public agencies.

In December 1995, with activation of PUBNet and affordable leased lines becoming available to public agencies, the penetration of the Internet began to accelerate rapidly. The government started to actively recommend Internet usage to public entities in 1997. In the latter half of the same year, to expand Internet connection from the public sector to the whole country, Internet networks were set up as part of the national high-speed network project and telecommunications carriers were allowed to launch their own Internet connection service.

Accordingly, relay nodes (high-speed routers) were installed in five major cities (Seoul, Busan, Daegu, Gwangju, and Daejon) and Internet networks were built and run via the backbone transmission network of the national high-speed network from the latter half of 1997. This marked the birth of the router based national high-speed network for the Internet or PUBNet (Korea National Network for Internet) built by KT.

PUBNet went through a pilot phase from September to December 1997 and started commercial service in January 1998. From then on, any organization using the national high-speed network could apply for Internet service anywhere around the country. Transmission capacity between relay nodes was 45 to 155Mbps. The number of subscribers rose explosively after commercial service was offered and doubled every three months.

Along with the change in the Internet access environment in Korea, frame relay switches were installed or expanded at 31 stations for subscriber access to satisfy the rapidly rising demand for broadband public Internet connections. The service continued until the commercial launch of ATM based public sector Internet service.

4.2. Phase 2: Completion of the Foundation (1998 ~ 2000)

Calls for a more realistic implementation plan as a way to accurately reflect rapid advancement in ICT and changes in user's service demands became louder after phase 1 of the national high-speed network (KII-G) project. A more realistic approach was also seen as the right course of action given the efforts mounted by advanced countries in building the ICT infrastructure. In September 1997, the status of domestically available ICT facilities and resources was reexamined and international policy trends and implementation examples were investigated. The result was the ICT Network Advancement Plan, a revision and refinement of the Implementation Plan for High-speed ICT Infrastructure established in 1995.

Pursuant to the new ICT Network Advancement Plan, the deadline for the plan was advanced by five years from 2015 originally to 2010 for earlier implementation. The objectives

were also clarified by project, and phase 2 of Implementation Plan for High-speed ICT Infrastructure was unveiled in May 1998.

The key objectives of phase 2 of the national high-speed network or KII-G to be carried out from 1998 to 2000 were:

1) Phased expansion of the backbone network to 144 local call zones around the country,
2) Optimized integration of switches, which were disparate by network,
3) Building an ATM switch network to enable affordable and efficient provisioning of a full range of ICT services, and
4) Building an ATM switch based Internet network to satisfy demand for Internet service in the public sector.

During phase 2, deployment of optical transmission network proceeded according to schedule, but deployment of ATM switches proved to be difficult. As the plan was to introduce the first ATM switch developed in Korea, there were problems in network deployment such as delays in equipment development and demands for better network performance and new features. The challenges were overcome and the phase 2 of the KII-G project delivered high-speed, high-capacity optical cable transmission networks and ATM switches to all 144 locations. The foundation of the high-speed ICT was now complete and ATM based high-quality Internet service was available not only in big cities, but also in small rural villages. In addition, with KII-G, more than 10,000 elementary, middle, and high schools around the country could now enjoy broadband Internet service free of charge at up to 256Kbps and at heavily discounted rates for higher speeds. The ICT environment for schools and educational service was markedly improved to create a solid foundation for digital education in the future. Phase 2, in other words, enhanced usage of the national high-speed network and opened a new chapter in service deployment.

4.2.1. Completion of the Backbone Transmission Network Infrastructure

During phase 2, 1,061km in optical cable and 271 optical transmitters were installed at 64 additional locations around the country in follow-up to phase 1 and thus completed the high-speed, high-capacity backbone transmission network linking 144 major cities around the country. To ensure reliability of the network, optical transmission lines were set up in double and triple layers. Multi-layer routes were introduced to support protective switch-over and detouring. With the rapid growth in the ATM switch network, large capacity optical WDM (Wavelength Division Multiplexing) devices were installed between sections of major cities to secure transmission bandwidth between ATM switches.

KT added or installed 96km of optical cables at 64 locations while Dacom added or installed 965km of optical cables at 14 locations. In total, KT installed 11,763km of optical

cable at 144 locations while Dacom laid 7,788km optical cables at 89 locations until phase 2. In line with the accelerated KII-G implementation plan, KT installed optical transmission networks by expanding 37 connection points. Dacom set up 14 connection points in year 1 of phase 2 and focused on upgrading in year 2 and year 3 without any additional installation.

KT built 229 units of transmission equipment linking two major cities (Seoul-Busan, Seoul-Gwangju) including eight 40Gbps WDM devices and upgraded local and long distance transmission networks to meet the growing demand for lines at user sites and to respond to the expansion of the ATM switch network. Dacom upgraded its network by installing 42 units including 12 WDM devices between major cities (Seoul-Daejon).

4.2.2. Completion of the ATM Switch Network Infrastructure

The key point of phase 2 KII-G was that ATM switches were fully introduced to create the nationwide ATM switch network and enabled full-fledged high-speed ATM service. Public institutions that previously had to rely on expensive leased lines could now use voice, leased lines, and Internet service simultaneously through a single ATM line to enjoy the benefits of both efficiency and low cost in line usage.

At the same time, on the basis of ATM pilot service offered to 43 pilot sites in Seoul and other large cities from June 1998 for test verification of ATM switches, the ATM switch network was expanded to 31 relay switches at 19 locations around the country covering large as well as small and medium-sized cities. A total of 241 subscriber switches and 188 access devices were set up to enable nationwide ATM service.

According to the basic plan devised for phase 2, 31 relay switches and 71 subscriber switches were to be installed to build the ATM switch network. However, given the rapid rise in Internet service at schools thanks to the granting of free Internet access at 256Kbps at elementary, middle, and high schools during phase 2, demand for Internet access grew to 7,000 lines to surpass the initial demand estimation of 3,500 lines by the end of 2000. Learning sessions organized to promote usage of ATM service and lower prices compared to leased lines also drove demand for ATM service upward.

In the end, to satisfy the rising demand, more subscriber switches were installed rather than increasing transmission capacity of existing systems. In total, 241 subscriber switches were installed, 170 more than initially planned 71.

As explained above, there were many potholes on the road to building the ATM switch network - the main goal of phase 2. There were delays in commercialization owing to 1) adoption of equipment developed for the first time in Korea for nationwide establishment of the

ATM network, 2) delays in network set up by operators due to new demands for additional features and need to verify service stability, and 3) difficulty in executing the investment budget within the project timeline. Other challenges included the need for emergency procurement to satisfy the massive flood in demand for school Internet service and the urgency to stabilize the commercial network at an early stage.

4.2.3. Completion of the Internet Network Infrastructure

In phase 2, the explosive growth in demand for Internet from organizations using KII-G made expansion of the KII-G network inevitable to satisfy the rising need for Internet service in the public sector. A high-speed router oriented node was built with 34 backbone routers and 87 relay routers in 18 cities around the country to enable Internet service at 56Kbp to 45Mbps.

In developing phase 2 Internet network implementation plan, some argued that because 90% of institutions using KII-G for Internet access used low-speed service of below 64Kbps, installing ATM switches up to the downstream network (Edge) would be unnecessary given the issues related to network reliability, economic viability, and lack of demand. However, many of the low-speed users were in the process of upgrading to 2Mbps or above Internet connection, and such stance contrasted against the argument that it was more desirable to build an ATM based multi-layer service network rather than having a different network for each service.

The position of the KII-G operator was for integrated operation of PUBNet and KORNet (Korea Public Sector Network for Internet). However, the government's final decision was to build an ATM based Internet network because 1) the operator's argument was not in line with the initial objective of offering ATM switch based Internet service, 2) such approach could not guarantee international line service quality as demanded by public institutions, and 3) it had security vulnerability, even though security was essential for public institutions.

The concept of open competition in service was also introduced to allow for not only KT's PUBNet, but also Dacom's PUBNet-Plus as a national network for the Internet. From July 2000, the commercial ATM switch network was activated to expand router based Internet service into ATM based Internet service. More specifically, before the opening of the ATM switch network, the Internet lines for the public sector were accommodated via a router network built by KT (PUBNet-I) to respond to the rising demand for Internet access. After activation of the ATM switch network, Internet connection service was gradually switched over to ATM based Internet networks (to PUBNet-II at KT and to PUBNet-Plus at Dacom).

Overall, phase 2 focused on efficient implementation of the national high-speed network while accommodating the government's policy objective and with consideration to carriers' positions. As a result, KII-G grew as a single network based on ATM service as well as a

network for multi-layer services including existing data services like frame relay and Internet.

The Korea Internet exchange node (KIX) intranet was upgraded to gigabyte capacity to enable Internet interconnection at home and abroad. Optical cable and satellites were used to provide total 85Mbps redundant Internet international lines to eliminate bottlenecks in interconnection sections and to offer more reliable service. In particular, with the rise in demand for overseas Internet access, the bandwidth for international lines was made redundant with U.S. submarine optic cable and satellite Internet and speed was increased from 20Mbps to 60Mbps.

4.3. Phase 3: Advancement (2001 ~ 2005)

Thanks to the phased implementation of the high-speed national network, Korea was able to successfully complete deployment of the high-speed national network based on nationwide optical cable, KII-G, at the end of 2000. It was also able to realize the world's highest broadband penetration rate. Encouraged by the success of phases 1 and 2 of high-speed national network implementation, the Korean government unveiled the Basic Plan for High-speed ICT Network Advancement in June 2001 to make Korea the world's leading ICT player in the 21st century. The plan was devised based on comprehensive review of demand for high-speed Internet in different sectors as well as the trends in development of high-speed information communications technology. The government also formed the Consultative Body for Advancement of the High-speed ICT Network in August 2001 to ensure effective implementation of the plan. The final Basic Plan for High-speed ICT Network Advancement including detailed action plans was announced in January 2002.

The goal of the Basic Plan for High-speed ICT Network Advancement was to create a basic universal framework to make multimedia service available to anyone, anywhere, anytime by 2005. The deadline was actually advanced from 2010 to 2005 owing to explosive growth in the number of Internet users and increased need for early advancement of the ICT network as a result of the rapid development in ICT technology.

A detailed action plan was developed to continue upgrading and expanding the network in line with the expected increase in demand in the public sector. As a result of three-phases of efforts, ATM switches were laid in all 144 call zones around the country to enable nationwide high-speed ICT service. The backbone transmission network was expanded to accommodate high-speed, high-capacity bandwidth required for expansion of ATM switches and Internet facilities. The backbone network was also made broadband to enable ALL-IP based high-speed high-quality Internet service through a nationwide network built with existing ATM switches as well as newly developed high-capacity ATM-MPLS switches. Furthermore, IDC has contributed to the advancement of Korea's broadband Internet and network equipment by

providing co-location services to businesses in need of the cost saving of integrated management or with difficulties in establishing their own transmission system (Backbone IX, L2, L4 equipment and etc.).

In other words, phase 3 of the high-speed national network was about infrastructure upgrading where advancement of the Internet and backbone transmission networks were simultaneously carried out with focus on ATM switches.

4.3.1. Backbone Transmission Network Upgrade

In the first and second phases, optical cable based backbone transmission networks were built at 144 locations around the country. Phase 3 did not involve laying any additional optical cables. Rather, ATM switches and optical transmitters were added as upgrades to meet the rising demand for Internet access. Upgrade of the backbone transmission network fully leveraged the legacy facilities in high-speed national and public networks to ensure the network's survivability and reliability. For more economic deployment, sections with high traffic were continually upgraded as demand increased.

The bandwidth for the backbone transmission network was expanded and 407 2.5Gbps optical transmitters and 93 10Gbps optical transmitters were added. The bandwidth for the backbone transmission network was also continually increased. Ninety-one (D)WDM devices, which are a higher version than existing WDM devices, were installed. KT installed 550 optical transmitters while Dacom installed 41 optical transmitters. More significantly, the first 10Gpbs device was developed with Korean technology and adopted for the high-speed national network.

4.3.2. ATM Switch Network Upgrade

In 2001, a subscriber switch was added in Yongduk, Cholwon, Inje, and Ullung so that all 144 call zones around the country now had a local ATM switch network node. Truly nationwide high-speed ATM service was enabled at last. For efficient use of network resources and continued development of new services, 20 relay switches, 83 subscriber switches, and 29 access devices were additionally installed during phase 3. Relay switches were upgraded from 10Gbps (ACE64) to 40Gbps (ACE256) and subscriber switches were upgraded from 5Gbps to 12.5Gbps.

4.3.3. Internet Network Upgrade

During phase 3 of the high-speed national network deployment, Internet interconnection points were upgraded for security and efficient usage of the Internet network. The international line bandwidth was expanded for phased expansion of the backbone network and subscriber

access network.

To effectively deal with the rising Internet traffic and to distribute traffic concentrating around existing backbone routers, 27 backbone routers were newly installed and 25 relay routers were included to eliminate bottlenecks in relay traffic.

At the same time, the bandwidth for Internet backbone was upgraded from 622Mbps to 2.5Gbps and backbone facilities were made redundant for network safety. Accordingly, sites using PUBNet-I - router based high-speed national network - were switched over gradually to ATM based PUBNet-II from 2000 to 2003. As a result, the high-speed national network for Internet now became a single ATM based network, which reduced costs and needs for investment thanks to reuse of idle facilities.

To upgrade domestic and international Internet service of the high-speed national network, the Korea Internet exchange node (KIX) was installed to increase speed at Internet interconnection points and to increase the bandwidth of international lines. The KIX intranet's interconnection bandwidth was increased to 2Gbps~5Gbps in 2001 and to 15.7Gbps in 2002, then again to 23.5Gbps in 2003 and to 49Gbps in 2004. By September 2005, the interconnection bandwidth for KIX had increased 10-fold since 2000 to 51.3Gbps. Interconnection bandwidth for international lines for the high-speed national Internet network had also steadily increased, from 24Mbps in 1998 to 355Mbps in 2001 in year 1 of phase 3 then to 620Mbps in 2002 and 775Mbps in 2003, reaching gigabyte grade in 2004. By 2005, interconnection was 1.8Gbps, allowing for reliable overseas Internet service. This is more than 50 times growth over 2001, and the bandwidth of the international lines has increased as a result of the strategic need for route redundancy to ensure survivability and to prepare for growth in Internet traffic as well as in Internet demand and line speed.

KIX is IX connecting non-profit public networks and acts as an integrated gateway for non-profit public Internet network traffic. It links seven non-profit public networks including PUBNet, five commercial Internet networks including KT-IX, and two overseas networks, KORNet and BORANet, in high-speed. To ensure reliable interconnection, traffic is continually analyzed and the trend is tracked for line increases and upgrades.

Thanks to the high demand for Internet service and the rise in traffic, the role and importance of the Internet exchange node (IX) located at the peak of the Internet increased as a core component of ICT infrastructure. However, most of the Internet infrastructure in Korea was built with Seoul as the center, and facilities for exchanging traffic among Internet providers (IX) were also all concentrated around Seoul. This meant that access for using information within the same area was only available via Seoul IX if ISP were different. Such structure meant low quality and speed for regional Internet users, and this exacerbated the digital divide

between regions. Backbone investment between regions and Seoul was also required. The government therefore accepted the demands of regional Internet users and established a traffic exchange deployment plan for Internet providers in regions to close the digital divide arising from Internet connection quality and to more efficiently utilize national ICT resources. According to this regional Internet exchange node (Regional-IX) deployment plan, the Busan IX (BIX) was built in 2003 as a pilot.

BIX (Busan Internet eXchange) was activated in May 2003 with the infrastructure of the Busan Educational Information Research Institute based on deliberations of the BIX Consultation Body set up with representatives of Busan Metropolitan City, common carriers, and universities in Busan. BIX handled Internet traffic for Busan and the Gyongnam region via its local IX without going through the Seoul IX. This drastically improved the data transmission rate. BIX also reduced the backbone investment for ISPs by about 60 billion won. Creation of local business was also expected to boost the growth of the IT industry in Busan through employment, creating added value and attracting IT industry players to the region. As usage of large capacity multimedia service is projected to increase in the future, traffic usage is also expected to increase exponentially. If Internet traffic was to be exchanged in Seoul via each ISP's backbone, quality would suffer and investment outlays would be higher. Clearly, exchange centers like BIX, where local traffic is processed locally, are also required in other parts of the country.

4.3.4. Competition Driven Advancement of the High-speed Public Network

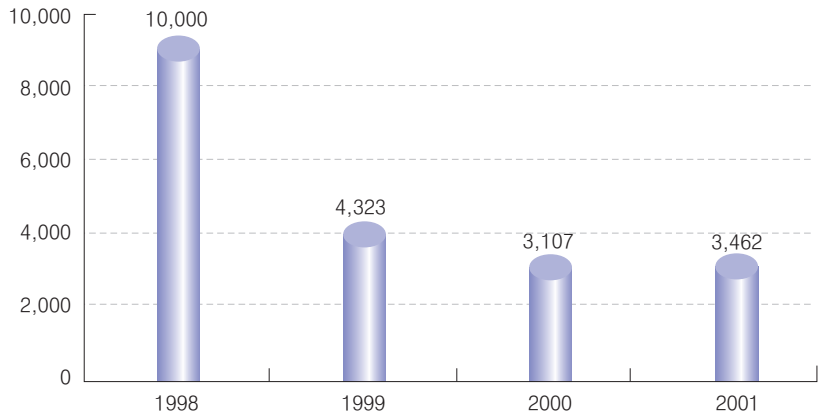
Advancement and penetration of the high-speed public network was achieved by promoting competition among operators. When service was launched, the government deemed that policy would be most effective if it promoted competition by minimizing regulation. Hence, new high-speed public network services were classified as value added services. This enabled free market access for operators and meant no restrictions on sales activities and charges including the tariff system. This also ensured that the competition in the telecommunications market would focus on facilities rather than services to encourage investment by operators.

The U.S., U.K., and other countries opted for local loop unbundling so that facilities of existing local carriers could be leased at cost to new entrants for high-speed Internet service. However, incumbent operators resisted leasing to stifle competition among operators. These countries are now taking note of Korea's success and are revising their policies with a view toward relaxing regulation to allow for joint usage of subscriber networks.

After increasing service penetration by promoting competition in facility installation, Korea introduced local loop unbundling in 2002 to further bolster competition.

The Herfindahl-Hirschman Index (HHI), a gauge of competition in the market, showed the index falling sharply for the first two years after its launch in 1998 - meaning that competition shot up in a very short period of time. However, KT had its own local network and a competitive edge. This allowed it to carve out a larger market share in 2001, resulting in a higher HHI level. In other words, competitive conditions in the market were worsening, but the main reason for this was mostly likely lower competitiveness of new entrants, who had less in investment funds and fewer stable alternative profit streams. Their situation was exacerbated by the fierce competition for subscribers among the operators, which drove marketing expenditures upward and the tariff rate downward.

Figure 2-2 | HII in the High-speed Internet Market



Note: Based on number of subscribers.
Source: Korea Communications Commission quoted in NCA(2005).

The competitive landscape for broadband Internet was still better compared to other key voice services like local, long distance, and mobile telephony. It was a success story in terms of promoting competition, and the heavier competition encouraged a wider subscriber base, lower tariff rate, more rapid technology development, and introduction of more new services.

The number of subscribers multiplied 33 times in just 30 months, from 265,000 at the end of 1999 to 8,938,000 by June 2002. This translated into an impressive 74% of total households and was the highest household penetration rate in the world. The data of June 2001 shows that Korea's broadband Internet penetration rate was two times higher than that of Canada, which had the second highest rate. This made Korea a country to benchmark for broadband Internet penetration.

The wider subscriber base also served to expand the broadband Internet market. Looking at quarterly sales, it multiplied 23 times from 37 billion won in Q1 2000 to 850 billion won by Q2 2002.

Table 2-6 | Sales of Broadband Internet Service

(Unit: in 100M won, %)

1Q 2000	2Q	3Q	4Q	1Q 2001	2Q	3Q	4Q	1Q 2002	2Q
37,003	85,904	200,203	319,226	460,227	540,756	594,024	647,168	779,683	850,352
-	132%	133%	59%	44%	17%	10%	9%	20%	9%

Source: NIA(2003).

The fierce competition among operators naturally exerted downward pressure on the broadband Internet tariff rate. The high-speed Internet service tariff was charged as a monthly fixed fee regardless of usage volume. The tariff was the sum of the subscription fee, installation cost, down payment, warranty insurance, monthly usage charge, and terminal rent. Initially, the terminal was expensive, so the charge for it was divided into the down payment and warranty insurance. These charges disappeared as competition became more heated and the prices for terminal fell. In the early days of service, only premium service with a high transmission speed was offered, but soon "Lite" services with a lower tariff and lower speed were introduced to widen the choices for consumers. The tariff rate was deemed to be the lowest among OECD countries by the PPP exchange rate.

Competition among operators also encouraged technology development for the high-speed public network. The CATV network was initially the stronger player with Thrunet offering CATV network based connection service. After KT entered the market, however, ADSL gradually gained the upper hand and became the most popular by May 2000 to reign as the dominant force since then. By June 2002, ADSL service subscribers totaled 5.53 million, and cable modem subscribers totaled only 3.15 million. There were also attempts to offer different technologies like B-WLL, satellite Internet, and Home LAN.

In the initial stage of broadband Internet diffusion, mostly quantitative competition took place but it turned into speed, in other words quality, competition in the early 2000s (2001~2002). In that process SLA (Service Level Agreement) was introduced to enhance quality competition and the convenience of users. The system is believed to play its role in improving the quality of broadband Internet and its advancement.

5. Management of the Informatization Promotion Fund

The Korean government, with the slogan 'We were late in industrialization. But we will lead the information age,' built the public consensus of the need for informatization since the 1990's and enacted the Basic Law of Informatization Promotion to pursue an informatization strategy at the national level. It also expanded the Information and Communication Promotion Fund (1993~1995), funded by contributions of telecommunication operators, and changed its name to the Informatization Promotion Fund to financially cover the government's IT initiatives. As the Fund was used to facilitate nationwide informatization efforts and further advance the IT industry, Korea emerged as a global IT superpower, ranked 1st in the ITU Digital Opportunity Index (DOI) consecutively in 2005 and 2006 and taking 2nd position in the infrastructure factor of the International Institute for Management Development's (IMD) World Competitiveness Yearbook in 2005.

The Informatization Promotion Fund consisted of General Account and Research and Development Account and was used for investments and financing for informatization and IT-related projects. As large-scale IT projects such as the construction of high-speed Internet networks and the 1st phase of e-Government were completed, which were the objectives of the General Account of the Fund, the General Account was closed in 2005, the title of the Fund was returned to the Information and Communication Promotion Fund to focus on investments into IT research and development initiatives.

Table 2-7 | Purposes and Sources of Informatization Promotion Fund[1]

	Purpose	Source
General Account	• Build high-speed Internet network and promote its utilization • Facilitate informatization in different areas: public, regional and industrial areas • Build a foundation for the growth of the IT industry	• The government's contribution • Profit from the operation of the Fund • Borrowings and other revenue
Research and Development Account	• Develop IT technologies • Nurture skilled IT resources • Develop and distribute IT standards • Build a foundation for IT research	• The government's contribution or loans • Mandatory contribution collected from telecommunication operators • Profit from the operation of the Fund • Borrowings and other revenue

1. In the case of IMT-2000, the amount is 1.3 trillion KRW per provider (in the form of contribution in 2000) and unlike other countries spectrum charge was transferred into a fund not into the general account so that the charge from the exclusive use of spectrum, a public resource, can be collected and used for informatization.

The Fund allowed the government a significant financial flexibility to perform large-scale projects at the national level. As the Fund was designed to support the government's implementation of informatization projects in a comprehensive way, it freed the government from restrictions of budget, timeline and human resources so that it could rapidly reflect changes in technology and environment into its IT projects. The execution of the Fund also led to the development of other related technologies and created new demand for business activities, accelerating the speed of the informatization through the society.

More specifically, the Fund, combined with the know-how of developing TDX, ATM and CDMA, and broad-band networks, allowed service, infrastructure and manufacturing sectors to jointly develop cutting-edge technologies such as mobile Internet service, called WiBro, and DMB (Digital Media Broadcasting) first in the world, and make them international standards. With this success, Korea gained the upper hand in the global IT market.

The Fund also contributed to a balanced development of different IT industries as it was used to renovate the old performance-oriented research and development system, foster demand-oriented personnel, build an environment for small- and medium-sized IT companies to grow in, and intensively boosts IT parts and materials industries and high value-added software industry. It also helped Korea reduce its technological gap with the U.S. from 2.6 years in 2003 to 1.6 years in 2006 with continued investment in research and development of new IT areas of growth. Lastly, the Fund-enabled development of IT technologies made mobile phone and Internet access a part of people's daily lives, enhancing the convenience of their lives.

Table 2-8 | Budget for Informatization and Informatization Promotion Fund

(Unit: in 100M won, %)

	1996	1997	1998	1999	2000	2001	2002	2003
Budget for Informatization	4,993	7,083	8,500	12,346	13,587	15,029	16,114	16,702
Share vis-a-vis general accounts	0.79	0.99	1.05	0.40	1.43	1.42	1.47	1.50
Informatization Promotion Fund	3,587	5,539	7,735	8,500	7,480	9,810	11,893	10,698
Total	8,580	12,622	16,235	20,846	21,067	24,839	28,007	27,403

Source: Ministry of Planning and Budget(2003).

According to the latest government reorganization, the fund-raising and execution of the Information and Communication Promotion Fund is no longer the sole responsibility of the MIC. Now the Korea Communications Commission (KCC) is responsible for fund-raising and the Ministry of Knowledge Economy (MKE) was responsible for operation and execution of the Fund.

Table 2-9 | Related Government Agencies and Legal Grounds

Task	Government Agency	Legal Ground
Fund-raising	Korea Communications Commission (KCC)	• Article 34 of the Basic Law of Informatization Promotion: source and purpose of the fund
Operation & Management	Ministry of Knowledge Economy (MKE)	• Article 35 of the Basic Law of Informatization Promotion: operation and management of the fund
Execution	Ministry of Public Administration and Security (MOPAS) MKE KCC	• Article 34 of the Basic Law of Informatization Promotion: Source and purpose of the fund
	KCC	• Article 28 of the Law on Establishment and Operation of the Korea Communications Commission: budget
	Ministry of Culture, Sports and Tourism (MCST)	• Article 7 of Enforcement Ordinance of the Framework Act on the Video Industry Promotion: financial source for promotion of video culture and video industry • Article 6 of the Online Digital Contents Industry Promotion Act: securing of financial sources

6. Policy Achievements

6.1. Achievements in the Construction of the High-speed Internet Infrastructure

The construction of high-speed internet infrastructure had tremendous effects at the national, economic, social and cultural levels. At the national level, the high-speed internet infrastructure enabled the establishment of e-government, leading to improved public services and enhanced efficiency and transparency in government and inter-company transactions. At the economic level, broadband led to improved productivity as the growth of the IT industry provided spill-over effects into all other industrial sectors. Improvement in business process among traditional companies in turn resulted in enhanced corporate competitiveness with heightened efficiency and productivity. Moreover, new industries and new business models were created, providing the foundation for securing future growth potentials. Finally at the social and cultural levels, the expansion of broadband infrastructure generated the so-called cyber culture and practices as well as a new set of orders and values, leading to better quality of life through the use of the Internet among individuals.

As for direct achievements of the government's investment in the high-speed internet infrastructure, it is estimated that the government's KRW680 billion investment until 2002 generated approximately KRW17.7 trillion worth effects, and additional KRW24.1 trillion of effects until 2005. Besides such direct achievements, indirect effects resulted from the investment are much more significant. It is believed that the establishment of high-speed internet infrastructure substantially contributed to boosting the nation's competitiveness by giving rise to KRW22 trillion in production, KRW16 trillion in value-added growth, 230,000 jobs and about 0.45% share of GDP growth until 2002.

Table 2-10 | Effects of the High-speed Internet Infrastructure Project

Effects	1995~2002	2003~2005	Total
Production	KRW22 trillion	KRW13 trillion	KRW35 trillion
Value-added	KRW16 trillion	KRW9 trillion	KRW25 trillion
Employment	230,000 jobs	130,000 jobs	360,000 jobs
GDP growth	0.45%	0.53%	0.47%

Note: Figures after 2003 are estimates.
Source: MIC(2003).

6.1.1. Public Services and Government Process Innovation

Broadband infrastructure brought informatization to government tasks at large. As a result, administrative productivity and transparency, and public services continued to improve. Particularly, infrastructures needed to support the e-government were completed in November 2002 with the execution of 11 government-driven initiatives aimed to build a centralized e-government channel (G4C, or Government for Citizen), an integrated national e-procurement (G2B, or Government-to-Business), a comprehensive national tax services (HTS, or Home Tax Service), and an integrated information system encompassing four social insurances, to name a few. G4C provides a single channel (www.egov.go.kr) to enable one-stop electronic civil services at anytime and anywhere. Demand for electronic civil services grew as the majority of the general public was given access to the broadband Internet services. With the realization of the e-government, common civil services such as address change could be handled online, and databases for major civil service information could be shared. Also, online processing of procurement amounting to KRW67 trillion a year for public institutions became possible, and citizens were able to pay various taxes online instead of visiting tax offices or banks, or get their tax-related complaints handled through the Internet. Other civil services also became significantly convenient with the Internet, enabling citizens to check and pay premiums concerning four major social insurances, or have all records related to the four social insurances to be automatically renewed with just one record update such as address change.

The establishment of the e-government not only improved the quality of civil services but it also improved productivity and transparency of government's administrative tasks. Key governmental tasks concerning human resources, finance, education and administration within government agencies, inter-government departments, and between the central and local governments went online, and use of electronic approvals and electronic documents enabled creation of paper-less administration, maximizing administrative productivity and transparency. Particularly, electronic approvals, pursued to improve administrative efficiency within the government, took root with the ratio of electronic approvals growing from 20% in 1998 to 80% in 2001. Electronic approvals spread to the central administrative agencies, leading to saving KRW180 billion in budget a year. As a result, Korea ranked 15th in 2002, 13th in 2003 and 5th in 2004 among 191 countries in the UN e-government rankings.

Table 2-11 | Korea's Ranking in the Global Information Indexes

Index Name	Purpose	2002	2003	2004	2005
E-government Readiness Index (UN)	Measures the level of e-government	15	13	5	5
Digital Opportunity Index (ITU)	Assesses a nation's degree of ICT advancement by analyzing dissemination of infrastructure, provision of opportunities and utilization	-	-	-	1
Network Readiness Index (WEF)	Measures a nation's ICT environment, readiness and utilization by individuals, corporations and the government	20	14	20	24
Global Competitiveness Index for Technology Readiness (WEF)	Measures a nation's technological competitiveness	19	11	18	11
Global Competitiveness Index for Technological Infrastructure (IMD)	Measures a nation's ICT competitiveness	17	24	8	2

Source: NIA (2008).

6.1.2. Productivity Improvement in Existing Industries and Creation of New Industries

The government's continued investment in the broadband infrastructure had a direct impact on the revitalization of the ICT equipment industry, and this immediately led to the advancement in the ICT services industry, providing the basis for facilitating informatization

across all industries. Such changes in the ICT industry boosted both revenues and net profits of companies, enhancing global competitiveness of the Korean IT industry and leading the nation's economic growth.[2]

The share of the IT industry in the nation's GDP growth more than doubled from 1.1%p in 1998 to 2.5%p in 2004. The IT industry also had a positive impact on both production and export: Production output grew by about 346% from KRW51 trillion and 445.3 billion in 1995 to KRW229 trillion and 232.2 billion in 2004. By sector, production output in the ICT services industry increased by 313% from KRW11 trillion and 144.5 billion in 1995 to KRW45 trillion and 994.1 billion in 2004. Production output in the ICT equipment industry grew by 115% from KRW38 trillion and 625.6 billion in 1995 to KRW83 trillion and 123.3 billion in 2004. Domestic software production was quite insignificant in the 1980s but began to grow rapidly in the 1990s with the rapid expansion of the system integration business. Software production output, which stood at about KRW1 trillion and 675.2 billion in 1995, expanded by more than 30% on average per year to reach about KRW18 trillion and 658.8 billion in 2004.

Table 2-12 | Contribution of the IT Industry to The Economic Growth in Korea (1999~2004)

	1998	1999	2000	2001	2002	2003	2004
GDP growth rate (%)	-6.9	9.5	8.5	3.8	7.0	3.1	4.6
ICT industry growth rate (%)	23.0	35.3	33.8	10.5	17.6	14.2	20.4
Rate of contribution (%p)	1.1	2.2	2.3	1.0	1.8	1.6	2.5

Note: GDP growth rate is based on market prices and ICT industry growth rate is based on base prices.
Source: Sangwon Ko *et al.* (2005).

Table 2-13 | Production Growth in the IT Industry in Korea (1995 vs. 2004)

(Unit: KRW trillion)

	1995	2004	Growth Rate
ICT Industry	51.4453	229.2322	346%
ICT Services	11.1445	45.9941	313%
ICT Equipment	38.6256	83.1233	115%
Software and Computer-related Services	1.6752	18.6588	1,014%

Source: KAIT IT Statistical Information Center Database.

2. Opinions are divided on IT contribution to improving the productivity of conventional industries and nurturing new industries. Enhanced productivity from capital deepening accompanied with IT facility investment expansion leads to enhanced labor productivity (Bank Of Korea, 2002) Controversies arose on the way in which enhanced productivity leads to Total Factor Productivity (TFP). For instance Gordon claimed that the New Economy phenomenon is a straightforward phenomenon accompanied with physical investment expansion such as productivity paradox (Gordon 2000; 2002). It was a part of controversies over the New Economy in the early 2000s and some in Korea also claimed that IT-led growth is a temporary phenomenon caused by physical investment expansion.

In the meantime, export of the ICT industry grew by about 195% from about USD31.7 billion in 1995 to about USD93.7 billion in 2004. Trade balance increased by 191% from USD15.1 billion in 1995 to about USD43.9 billion in 2004.

Table 2-14 | IT Industry Growth Rate in Korea (1995 vs. 2004)

(Unit: USD billion)

	Export	Import	Balance
1995	31.7	16.7	15.1
2004	93.7	49.8	43.9

Source: KAIT IT Statistical Information Center Database.

When it comes to the achievements of the government's informatization drive through the ICT infrastructure advancement and e-government initiatives, the number of mobile phone subscribers, the number of computers, the number of Internet users and the number of broadband users per 100 inhabitants grew by 40%, 18.9%, 62.7% and 110.3%, respectively, on average per year between 1995 and 2004. Particularly, the growth in the number of broadband users per 100 inhabitants was exponential. Since the statistics of broadband users were first gathered in 1998, the number rose by as much as 80,311% from 0.03 users in 1998 to 24.8 users in 2004 per 100 inhabitant, which were more impressive results than other countries. Korea is ranked in the upper echelon in the communications infrastructure, government's informatization support and other global indicators that compared each country's degree of ICT infrastructure and utilization.

Table 2-15 | Korea's Level of Network Utilization (1995 vs. 2004)

(Unit: Person)

	1995	2004	CAGR	Growth Rate
Number of mobile phone subscribers per 100 inhabitants	3.7	76.1	40.0%	1,966%
Number of computers per 100 inhabitants	10.9	51.7	18.9%	374%
Number of Internet users per 100 inhabitants	0.8	65.7	62.7%	7,895%
Number of broadband users per 100 inhabitants	0.03*	24.8	110.3%	80,311%

Note: * is for 1998.
Source: ITU Database.

Advances in high-speed internet infrastructure not only facilitated development of the ICT industry but it also triggered many changes in other industries across the board. Services using online facility quickly spread to other industries, and these changes affected business process

within companies, boosting work efficiency and profitability. Informatization within companies was accelerated, leading to improved corporate competitiveness. Informatization of workforce and creation of new jobs resulted in upgrading quality of workforce.

Advances in high-speed internet infrastructure also created new industries such as online financial services, Internet broadcasting, Internet gaming and e-commerce that were not part of traditional business setup. These changes provided opportunities for companies facing limitations in generating profits from their traditional business models to proactively identify new industries and grow in the digital era. Promotion of corporate informatization aimed at improving corporate productivity and competitiveness in such traditional industries as shipbuilding, automobiles and textiles led to cost reduction and productivity enhancement through business innovations. The government provided supports for a number of informatization initiatives targeting SMEs, including IT lease-based informatization and provision of solutions tailored to each sector and company size, to accelerate informatization among SMEs. The government also led the effort to pave the way for e-commerce for each industrial sector including electronics, automobiles and construction.

6.1.3. Upgrade of Informatization Level and Online Culture among the General Public

The increased communications speed offered by the high-speed internet infrastructure led to the widespread usage of various content streams such as e-mail, chatting, Internet shopping and information search, as well as a significant enhancement of individuals' informatization. Moreover, the utilization of online content, online trading, Internet banking, electronic administrative services and other online work processing contributed to the improvement of quality of life and the level of satisfaction with life among individuals by changing the way people lived.

According to the data released by the Pew Internet & American Life Project in December 2007, 93% of American teens use the Internet and most use it as a venue for social interaction - to share creations and interact with others in the digital space. Korea is also one of the countries where Internet communities are most active. For the last one month, it is found that more than 30% of Koreans used online communities, indicating that daily offline activities are being increasingly replaced with the digital networking. Furthermore, the widespread use of broadband brings many changes not only in people's daily life but also in politics. People increasingly participate in politics through the Internet, which is meaningful in a sense that it facilitates policy efficiency, responsibilities and civilian participation in politics. Revitalization of Internet media, growing use of home pages by politicians and a broad online participation by 'netizens' serve as a new channel for forming public opinions.

Broadband also contributed to disseminating the use of the Internet in people's cultural activities and in utilizing knowledge by facilitating distribution of multimedia content. Use of media through the Internet was nothing short of a revolution compared with those times when the Internet was not used. Newspapers, magazines and other media printed in paper went online and the broadcasting circles are also shifting from one-way broadcasts to two-way multimedia services. Also, a myriad of professional online media outlets capable of providing Internet media services far exceeding offline media both in quantity and quality is sprouting up. In fact, visits to digital newspapers have approximately doubled since 2001 when broadband began to be widely used.

Along with the construction of the high-speed internet infrastructure, the distance learning business also grew at a rapid pace. Internet educational web sites encompass online virtual universities, corporate training, certificates and licenses, English language education, education for primary and middle school students, and educational portals. As for public education, online universities and online lectures became revitalized as students became able to share online multimedia information. Online education also penetrated into private education after the Internet began serving as a channel to fulfill demand for education among the general public. Company employees increasingly find online as a useful place to get lifelong education with companies actively providing online training programs. In addition, online education offered by online universities at below 30% of university tuition fees and relatively cheap online private lessons also resulted in saving educational expenses.

Table 2-16 | Achievements in Informatization among Companies and Individuals

	Year of Introduction	2004	Growth Rate (%)
Number of Internet banking users	1.23 million (1999)	24.27 million	1,873
Online stock trading	KRW11 trillion (1998)	KRW37 trillion	236
E-commerce volume	KRW58 trillion (2000)	KRW314 trillion	417

Source: Oh Gwang-seok (2005).

6.2. Achievements in the Management of the Informatization Promotion Fund

The promotion of informatization requires large scale investment, calls for cooperation of various organizations, and lasts for several years. So, it is difficult to carry out the projects with the general budget. The Informatization Promotion Fund was established in 1996 as a special vehicle to overcome the budgetary restrictions in order to promote the informatization project. The goals of the Fund is to promote e-Government, roll-out broadband network, support R&D and standardization and educating human resources in ICT. Thanks for the Informatization

Promotion Fund, necessary funds to realize these goals could be adjusted flexibly, allowing skills/market environment changes to be swiftly reflected in ICT industry. The Fund, based on government budgetary and private sector contribution, created the system for letting the profits from ICT fields be reallocated into ICT sector. The Fund was managed by Ministry of Information and Communication (overall management), Institute of Information Technology Assessment (specific project management) and Fund Management Council (Evaluation). The chair of the Council was vice minister of MIC and members are director generals of related ministries.

Table 2-17 | Major Achievements of IT Research and Development Projects

Year	Description of Technology Development	Remark
1994	• Developed medium-sized computers (mainframe computers III) • Developed 256M DRAM	The world's first
1995	• Developed TDX-10, electronic telephone exchanger	
1996	• Developed CDMA digital mobile communication system	The world's first
1998	• Had CDMA technology adopted as international standards • Developed mainframe computers IV	Europe and the U.S.
2000	• Launched synchronous CDMA-1x service	The world's first
2002	• Launched synchronous CDMA-1x EV service	The world's first
2003	• Developed a terrestrial DMB system	The world's first
2004	• Developed a pilot product of mobile Internet device (WiBro)	The world's first
2005	• WiBro adapted by the Institute of Electrical and Electronics Engineers (IEEE) as global standards • Terrestrial DMB adopted by the European Telecommunications Standards Institute (ETSI) as European standards	IEEE 802.16e
2006	• Developed a server system for a network robot (Ubiquitous Robotic Companion)	The world's first

Unlike Korea, which had a comprehensive fund covering all areas of informatization, most other countries including the U.S. set up a supplementary temporary fund specific to set objectives like closing the digital divide or developing e-government. The government established the Informatization Promotion Fund to extend funds to all areas of endeavors in national informatization so that many informatization projects could be carried out flexibly instead of being constrained by strict timelines and budget limits. This allowed technical and market changes to be quickly incorporated into projects. Initiatives such as informatization of municipal and district administration and financial information system implementation especially required flexibility in funding as they involved different ministries or aimed to achieve grand strategic goals. In other words, by making investment funds more readily

available as needed, the Informatization Promotion Fund allowed Korea to establish a solid foundation for the knowledge information society in a very short period of time.

Although the Fund allowed the government to continually expand its investment in informatization, lax management of the Fund sometimes gave rise to criticism. However, there can be no denying that the Fund helped create demand for ICT technology development and service, thereby accelerating informatization across different sectors of society. In particular, during the 1997 financial crisis, when the public sector had to lead investment as part of the economic recovery efforts to create jobs and revive the economy, active investment in upgrading the ICT network spurred active participation by the private sector as sufficient future demand could be expected with confidence. It also helped Korea make another leap ahead in ICT adoption.

From 1993 to 2002, the Fund reached total of 7.78 billion USD. About 40% of the Fund (3.06 billion USD) came from government budget, 46% from private firms and 14% (1.13 billion USD) from miscellaneous profits and interests. Total of 5.33 billion USD is invested from 1994 to 2003. 37.5% is invested into IT R&D, 20% into informatization promotion, 17.8% into ICT human resource development, 15.1% into broadband infrastructure and promotion, 7% into infrastructure for IT industry and 2.6% into standardization.

It is evaluated that the Informatization Promotion Fund played a key role in the balanced promotion of informatization policy for the creation of demand and the ICT industry policy for the expansion of supply base.

The Informatization Promotion Fund was an important means of facilitating a virtuous cycle of ICT development in Korea. It played the critical role of ensuring that IT industry policy was carried out according to a comprehensive and balanced perspective between creating demand for ICT and expanding public infrastructure.

The Fund allowed various informatization projects and IT research efforts to be carried out more flexibly without being shackled by rigid budget constraints. Informatization projects not only require heavy investment but need different organizations to work together for many years for common usage of information and interface of disparate information systems. Receiving support from the government budget, which is normally planned and executed by each administrative body on an annual basis, was therefore an issue. The Informatization Promotion Fund meant that each project could have a different timeline and that the required budget could also be flexibly adjusted. This allowed any changes in technology and the market to be quickly reflected in the projects.

The Fund also offered a mechanism where public investment in the ICT sector could be

managed efficiently as a single fund. The Fund pooled and managed all funding for informatization including government grants, telecommunications service providers' investments, and loans into one single fund for easy tracking of investment coming from the public sector toward informatization and the IT industry.

Pursuant to the Framework Act for Informatization Promotion – the law that created the Fund - investment coming from telecommunications service providers could only be spent for R&D in the IT sector so that the benefits realized by the IT industry would not be leaked to other industries. It established an official mechanism whereby gains from ICT investment were reinvested in ICT. The Fund, in other words, was a solid financial sponsor, and it allowed the Korean IT industry to grow steadily without being vulnerable to any internal or external changes.

Lastly, the Fund offered political means to comprehensively review national informatization projects like building the high-speed information infrastructure, e-government, and ICT adoption for businesses to be considered together with promotion of IT industry growth from planning to resource allocation. As informatization projects were handled through the Fund's general accounts while supporting R&D tasks through R&D accounts, the government could allocate resources with consideration to both supply and demand in achieving set goals for ICT policies.

7. Policy Implications

As examined so far, the successful construction and dissemination of broadband network in Korea is attributed to a combination of factors, including the government's clear vision, its strong will to drive forward policy, vigorous investment by the private sector, active consumption by consumers, introduction of competition to the communications industry, low rate-setting policy, and the unique Korean culture suitable for the Internet environment.

With the rise of the informatization era, the government recognized the importance ICT and established the Ministry of Information and Communication in December 1994 with a strong will to build a broadband network. The ministry enacted the 'Framework Act on Informatization Promotion' in March 1995 in order to promote public sector informatization and facilitate investment in informatization by the private sector, create demand for the electronic information industry, promote the SME-centered information industry through the increased government and private sector investment in research and development, and expand funding and tax benefits for the information processing industry. To fund informatization projects, ICT research and

development efforts, and broadband network projects, the ministry set up the informatization promotion fund in 1996. Finances needed for the fund comprised the information and communication promotion fund, proceeds from the sale of KT shares and others. The establishment of the Ministry of Information and Communication and the subsequent enactment of the Framework Act on Informatization Promotion and the set-up of the informatization promotion fund laid the groundwork for a successful execution of the broadband network project.

As mentioned earlier, the government enacted the Framework Act on Informatization Promotion in 1995 and undertook the broadband network construction project in phases. In doing so, the government encouraged KT, Dacom, and other private sector companies to actively invest and participate in the project in order to ease the burden on the investment of the project pursued at the national level. For this, the government established the 'loan support system for subscriber line expansion' for early creation of the broadband services market. Designed to grant loans at low interest rates to service providers, the loan system covered all regions to maximize the effects in 1999 when it was first introduced, then limited its beneficiaries to small and medium-sized cities and farming and fishing communities to promote a balanced informatization since 2000. The government also amended relevant laws to ensure that KT continue to be involved in the construction of the broadband network in fishing and farming regions even after the company, the nation's largest fixed-line service provider, became privatized. Common carriers such as KT and Dacom contributed to generating early demand as well as increasing demand later on by providing free broadband services to noncommercial organizations including the government, government-affiliated organizations and schools, besides their active investment in the broadband network mentioned earlier.

Moreover, the government introduced the Local Loop Unbundling System in 2001 when the broadband market was already entering the growth phase, unlike most other countries that introduced the system in the early stage of market creation. The purpose was to expedite establishment of the broadband network by encouraging service providers to compete on facilities, not on services, and aggressively manage their business to recoup investment in facilities. Consequentially, entry barriers to the broadband services market were removed, enabling entry by common carriers and a subsequent fast growth. Also, the government classified broadband services as value-added telecom services, unlike fixed-line and mobile telecom services, and introduced free competition to rate-setting, rather than regulating it, to induce low service rates, which eventually served to drive a fast growth of the broadband services market within a short period of time. Other efforts made by the government to create demand for Internet services included execution of informatization education for 10 million Koreans, dissemination of cheap Internet PCs, and informatization of public and private sector companies.

Finally, high-density housing and trend-conscious national character are also credited with the successful establishment of broadband network in Korea. As the majority of Koreans reside in high-density cities and almost half of these households (48%) live in large-scale apartment complexes, broadband services could quickly gain popularity. Korea's diligent people and lack of resources also played a role in readily accepting broadband connections that deliver fast Internet services. Use of broadband services capable of providing a tremendously improved speed rapidly spread among users who were unhappy with the dial-up service speed. Moreover, the new business model 'Internet cafes' that emerged in 1994 also played a big role in introducing broadband services. In keeping up with the demand for Internet cafes, broadband network construction was sped up across the nation, which is believed to have accelerated informatization in Korea.

In conclusion, Korea's broadband network construction project, combined with an appropriate competition policy, resulted in building a world class broadband infrastructure. The government directly invested in building broadband network for the public sector, and induced facility-based competition in building broadband network for the private sector. Although facility-based competition has a weak economic efficiency as it incurs overlapping investments unlike service-based competition, it has the advantage of accelerating dissemination of infrastructure by making companies compete with each other for investment. Under the facility-based competition environment, late entrants aggressively invested, which led to an early establishment of the ICT infrastructure and a rapid expansion of subscriber base. This created a virtuous circle in which service providers who gained economies of scale lowered rates, winning more subscribers. The informatization promotion fund played a big role in enabling the government to drive such a policy. The fund, aimed specifically at nurturing the ICT industry, was set up by collecting contributions from the ICT firms through the selection of new telecom operators, and was tremendously instrumental in enabling the government to intensively invest in the ICT initiatives with a long-term vision.

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9 788980 635771 94320
ISBN 978-89-8063-577-1

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