# .kp

# North Korea

Kyungmin **Ko**, Seungkwon **Jang** and Heejin **Lee**

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|---|---|
| Total population | 23,113,019 (July 2006 est.) |
| GDP per capita | USD 1,800 (2006 est.) |
| Key economic sectors | Military Products, Machine building, Electric power, Chemicals, Mining (coal, iron ore, magnesite, graphite, copper, zinc, lead and precious metals), Metallurgy, Textiles, Food processing, Tourism |
| Fixed-line telephones | 980,000 (2003) |
| Mobile phone subscribers | 20,000 (2004) (*Yonhap News* 2005, p. 234) |

Source: CIA. (2006). *The world factbook*. Retrieved from https://www.cia.gov/cia/publications/factbook/geos/kn.html

## Overview

North Korea often appears in the media due to its disputes with the international community regarding its development and testing of nuclear weapons. Little else is reported and known about the country. ICT development is an example of an area in North Korean development in which there is much activity but about which little is known outside. Since the mid-1990s, ICT has been emphasized as a strategic industry in North Korean economic development.

In this chapter, we report the current status of ICT development in North Korea. It is not easy to retrieve reliable information on ICT in North Korea, and the information that is available is not always accurate. Even statistics published by international organizations like ITU are not updated regularly. Therefore we have constructed a data set that is as consistent as possible with some policy reports (for example, KIPA 2000; Lee, J.-W. 2003) and newspaper articles from North and South Korea.

## Infrastructure

North Korea's telecommunication infrastructure lags behind the telecom infrastructure of many other countries. According to the *World Telecommunication Development Report* (ITU 2001), for example, the number of fixed-line telephone subscribers in 2000 was only 1.1 million out of a total population of about 23 million. This figure is higher than the *The World Factbook* (CIA 2005) estimate of 0.98 million as of 2003. At present, mobile telephones in North Korea are only for the privileged. The first mobile service was launched in Pyongyang and Rasun in November 2002. The number of subscribers at the time was 3,000. This grew to over 20,000 by December 2003.

Since the 1990s, the telecommunication infrastructure has been built up with some notable achievements. In 1994, a fibre optic cable factory was built in Pyongyang and a cable network was completed between Pyongyang and Hamhung. In 1998, a fibre optic cable network was laid out from Pyongyang to Sinuiju (400 km) with aid from UNDP. Fibre optic cable networks connect over 200 districts (called *kun*) nationwide and are being extended to the smallest administrative units (called *li*) (Lee, J.-W. 2003). Mobile communications has been extended to major cities. For the completion of the nationwide mobile communication network by 2007, infrastructure, including mobile base stations, is being built (Yonhap News 2005).

A nationwide network or Intranet, called Kwangmyong (meaning 'bright light'), was built in November 2002. The Central Information Agency for Science and Technology (CIAST), which is responsible for building and managing the Intranet, runs a portal site that is also called Kwangmyong. The portal offers a variety of services, such as database search, e-mail, website search, electronic library, real-time chatting, electronic commerce, and entertainment (Kwon 2002). This domestic network is open to the public in Pyongyang, the capital city. They call it the '170 Network', after its modem connection number. The modem speed is 56 Kbps. The network is also connected via fibre optic leased lines. It is used mainly for e-mail (Lee, S. 2004).

In April 2004, an Internet café was opened through which ordinary people can use the Internet. However, access is limited to the domestic network; the real Internet is closed to the general public.

There are no commercial ISPs in North Korea. The servers of North Korean websites are located in Japan, China and

Germany (Akutsu 1999; Ko 2004). There are very few websites with North Korea's domain name .kp, and those that exist have appeared only recently. Examples are the Academy of Sciences' websites for science and technology (http://www.stic.ac.kp) and for medical science (http://www.icms.he.kp) (*Junja Shinmun* 28 July 2003). However, these sites are available only on the Intranet and are not accessible from the Internet. It seems that these are test sites for the opening of the Internet in the future.

## ICT industries

The hardware industry in North Korea is not developed due to limitations such as lack of financial resources and technological capability and, most of all, the 1996 Wassenaar Arrangement which bans countries that endorsed it from exporting to North Korea high-technology materials and technologies that can be converted to military use.

Nonetheless, with the support of the government, there have been some developments in the North Korean hardware sector. For instance, the Ministry of Electronic Industry was established in 1999 to foster computer hardware technology. The Morning-Panda Joint Venture Computer Company, which produces personal computers, was founded in 2002 by the Electronic Products Development Company and Nanjing Panda Electronics Company, a Chinese company (*Chosun Shinbo* 15 March 2001). Since April 2004, the Korea Institute of Industrial Technology and the Samilpo Information Technology Center have jointly developed and are working on the export of Hana 21, a personal digital assistant (Yonhap News 2005).

Due to the limitations mentioned earlier, more attention is being given to software development, which is viewed as strategic to the growth of the North Korean economy (Park 2003). North Korean organizations have developed a number of software products (Hayes 2002), some of which have received positive evaluation (Lee, J.-W. 2003; Ko 2004). For example, Silver Baduk, the computer version of the Asian chess game Baduk which was developed in the Korea Computer Center (KCC), was awarded the first prize at the world computer Baduk competition in 1998, 1999, 2004, 2005 and 2006 (Shin 2004).

Like other developing countries that are motivated by India's success story, North Korea is keen on exporting software, including offshore services. For example, KCC recently invited a Dutch IT consultant specializing in offshore software development projects (Tjia 2006). Some of the mobile games made by KCC are already popular in Japan. KCC also provides offshore services for clients in China, South Korea and Japan. In addition, some companies in Pyongyang are involved in entry-level business process outsourcing activities. For example,

they offer back-office services to Western companies engaged in doing business with Japan and conduct data-entry work for international organizations like the UN and the International Red Cross. According to Tjia (2006), the level of IT expertise in North Korea is high, quality is assured through adherence to ISO 9001, CMMI and Six Sigma standards, and the IT sector is dynamic, with new firms and ventures being established.

To promote and support the development of ICT in general and the software industry in particular, two significant laws have been passed—the Computer Software Protection Law in June 2003 and the Software Industry Law in June 2004. They are significant because they signal to foreign companies that North Korea will abide by business practices common in the West and that the country is interested in attracting foreign investment in its software industry. The Computer Software Protection Law aims to protect software copyright, promote adherence to copyright provisions of international treaties and promote international cooperation (North Korean Law Society 2005). The Software Industry Law defines principles of software industry development, software writing and distribution, infrastructure building and international cooperation (North Korean Law Society 2005). These two laws are unprecedented in other industries and they clearly indicate that the North Korean authorities consider the development of the software industry a strategic goal (Lee, C. 2003; Lee, T. 2003).

In addition, other laws and regulations such as the Foreign Investment Law, Contractual Joint Ventures Law, Joint Ventures Law and Foreign Enterprise Law (Park 2004) contribute to software industry development by allowing tax exemptions and tax reductions for foreign investors. Further, legislation enacted in 2002 for the development of special economic areas such as Sinuiji, Mount Kumgang and Kaesong are specifically designed to boost foreign direct investment in high-technology industries, including ICT (Park 2004).

In 2001, North Korea signed international agreements on intellectual property rights, namely, the World Intellectual Property Organization (WIPO), the Paris Convention for the Protection of Industrial Property and the Patent Cooperation Treaty (PCT) (Park 2004). However, we have yet to see whether these laws work in practice, as declared.

## The Single Leap strategy and key institutions

The North Korean government has sought to boost the ICT industry since the mid-1990s (Lee and Hwang 2004). In 1998, Kim Jong-Il adopted a policy emphasizing science and technology. In 2000, major newspapers, in a joint New Year editorial, noted

science as one of the three major pillars for the construction of Kangsung Taeguk ('a strong and big nation'), along with ideology and arms (Bae 2001). Kim Jong-Il also emphasized the need to develop ICT (Lee and Hwang 2004). ICT is identified as a strategic industry in policies emphasizing the importance of science and technology.

North Korea aims to maintain the socialist system while leapfrogging to the information era (Bae 2001; Seo 2001). This development strategy, called Single Leap, aims not just for catch-up but for breakthrough. North Korean leaders view ICT as playing a key role in the 'Single Leap' strategy (Hahn 2003). Thus, after his May 2000 secret visit to Zhongguancun, the Silicon Valley of China, Kim Jong-Il ordered his government to promote ICT (Bae 2001).

In North Korea, the institutions in the ICT sector are steered by the central government. The Ministry of Posts and Telecommunications is responsible for telecommunication policies and the Ministry of Electronic Industry for IT industries. However, to achieve centralized control over information and communications, the Korean Workers' Party (KWP) and intelligence agencies like the Department of National Security and the Ministry of People's Security help formulate telecommunication policies (Ko 2004).

Since the development of ICT industries was identified as one of the strategic goals for national development in 2001, the Party has taken the lead in ICT development. In December 2001, the Party created a new unit, the Bureau 21, to direct ICT development. The bureau is so named because of Kim Jong-Il's idea that 'the 21st century is the age of information technology industries' (North Korean Central Broadcasting Agency 19 April 2001).

Guided by the Ministries and the Party, six key players are working in the ICT sector: the Academy of Sciences, Pyongyang Informatics Center (PIC), Korea Computer Center (KCC), Kim Il Sung University, Kim Chaek University of Technology and Pyongyang University of Computer Technology (Hayes 2002).

The Academy of Sciences set up the Department of Computer Science in 1983, to focus on basic research in ICT. Software products developed by the Department are exported by the Baeksong Trading Company, which is the commercial arm of the Academy.

PIC was founded in 1986 with support from the Pro-North Korean General Association of Korean Residents in Japan and UNDP. It aims to become the centre of development and education for computer systems (Hayes 2002). PIC sells some of the products it has developed at its Singapore office. PIC has a partnership with the Osaka Information Center (OIC) and runs a training centre for IT professionals (Lee, J.-W. 2003).

Founded in 1990, KCC is the largest IT company in North Korea with more than 1,000 employees (Tjia 2006). It aims to accomplish computerization in a variety of sectors, to develop technology for programming and to promote technology exchanges in computing areas. KCC has a company for international businesses, which deals with joint development, subcontract development, software export and technology and expert exchange programmes with foreign companies. KCC also has an office in Beijing specializing in export (KCC 2003).

The three other prestigious universities are discussed in the next section.

## ICT education

Until 1985, education and training in most universities and computer-related institutions had focused on hardware (Song and Choi 2005). Software became the centre of ICT education in North Korea after Kim Jong-Il emphasized the importance of software development and software specialist education at the 8th National Computer Program Contest and Exhibition in December 1997. Kim Jong-Il also ordered the inclusion of a computer subject in the Year 11 curriculum at the National Contest and Conference of Voice Recognition Program held in February 1998 (KDI North Korea Team 2001).

Some top universities play a major role in ICT education. They have been offering programming courses since 1999.

At the Kim Il-Sung University, the most prominent university in North Korea, the Faculties of Automation and Physics have been restructured to form the Faculty of Computing. The university also established the Information Center for software research and development in 1999.

Kim Chaek University of Technology is one of the leading universities in science and technology. As early as 1983, it set up the Computing Research Center and the Faculty of Computer Engineering. In November 2001, it created the School of Information Science and Technology (Song and Choi 2005).

The Pyongyang University of Computer Technology was established in 1985 to develop both hardware and software experts. Its reputation in IT education was formed in 1997 when its graduates swept prizes in many national computer programming contests. The university plays an important role in educating computing teachers as well as in training IT specialists for industry.

One of the distinctive characteristics of North Korea's education system is the focus on gifted students. Since the publication of his paper on education systems in July 1984, Kim Jong-Il has emphasized the importance of educating gifted young people for the development of high-technology industries. Special classes

in computers, science and mathematics were established for talented students in Kim Chaek University of Technology in 1999. In secondary schools, there are special classes for computer prodigies who then move on to prestigious universities like Kim Il-Sung University and Kim Chaek University of Technology (*Rodong Shinmun* 29 April 2001). This specially trained cadre of computer specialists forms the core of the ICT workforce in North Korea (*Chosun Shinbo* 7 May 2001).

Aside from focusing on training highly gifted students, the North Korean government also seeks to promote the importance of ICT to the whole of society by organizing festivals, exhibitions, lectures, contests and conferences. These activities aim to raise public awareness of science and technology development and encourage researchers and technologists to improve their productivity and share their experiences and knowledge with other researchers and with the rest of society.

## Digital content and online services

The Internet in North Korea is under the strict control of the State. Despite the recent opening of an Internet café in Pyongyang, Internet access is restricted. Therefore there is little digital content for public consumption. Most content is produced for political purposes. For example, news websites deliver online news contents from government-operated offline media like Chosun Tongsin (Central News Agency of Democratic People's Republic of Korea) and *Pyongyang Times*.

However, some commercial websites have appeared recently (Ko 2003; Song 2003). To attract tourists to North Korea, a website called Arirang (www.arirang.dprkorea.com) was launched in April 2002; it also promotes the national mass game that is also called Arirang. Three months earlier, in January 2002, the DPRK National Tourism Administration opened a website called Chosun Tour (www.dprknta.com) in Japanese with the assistance of the Japan National Tourist Organization. Since then a few other commercial websites have been put up. A website in English was developed for e-commerce (www.chollima-group.com) and the North Korean Embassy in Austria opened a website (www.dprkorea-trade.com) to sell North Korean specialties online.

Since the economic reform in July 2002, some online activities have emerged. The Advanced Technology Service Center in Pyongyang runs an online shopping site. Authentication systems are required for electronic transactions. The 626 Technology Service Center has been appointed as the national authentication certificate issuer, indicating that more shopping sites will be put up in the future (Lee, S. 2004).

Although the Internet is recognized in North Korea as increasingly important, only the privileged are allowed to use it. North Korean leaders are concerned about the impact of the Internet on the stability of the regime. In an interview with *Chosun Ilbo* (3 October 2003), a North Korean newspaper, the president of Chosun Posts and Telecommunications Corporation, Mr Hwang Chol-Poong said that 'North Korea will not open the Internet due to the possibility of threats to the national security.' However, the North Korean government recognizes the potential economic value of the Internet. Thus, it faces the dilemma of whether to court political instability in exchange for economic gains by opening up the Internet.

## Open source initiatives

KCC has developed Red Star Linux version 1.2 as its official operating system for nationwide use (*Junja Shinmun* 19 March 2002). Linux Arirang 2.0, another operating system developed at the Kim Chaek University of Technology, was awarded the silver medal at the 14th National Computer Program Contest and Exhibition in 2003 (Ministry of Unification 2003).

Linux-related R&D is growing. Kim Chaek University of Technology has completed a series of projects for the development and upgrade of Linux operating systems. It was thought that R&D in Linux would be the first step toward an indigenous operating system in North Korea (*Hankyoreh* 31 October 2001). At KCC, about 20 per cent of programmers use Linux, and over 70 programmers have been working on the development of North Korea's own operating system (Yoon 2004; Jung 2006).

Kim Jong-Il has also underlined the significance of North Korea having its own programming tool, which explains the North Korean authorities' eagerness to use open source software, including Linux. The leaders of the North Korean computer institutions believe that tools borrowed from abroad allow only a limited range of development, and that making their own tools, such as programming languages, will enable North Koreans to achieve more (*Yonhap News* 21 June 2006). Using Linux as the foundation of the indigenous Korean operating system is expected to foster independence from US-made software (Yoon 2004).

However, the campaign for independence in the software industry using open source software is fraught with many obstacles. For example, it is said that efforts to register a North Korean version of the Mozilla Web browser as a formal project (ko-KP) and requests for information regarding how to support

the source code to use the North Korean encoding protocol (euc-KP) in Mozilla, were stymied by the US rules forbidding the export of encryption algorithms to countries like North Korea, which the US government considers to be a terrorist threat (Yoon 2004).

## Cooperation between North and South

Since the historic summit between North and South Korean leaders in 2000, there have been many activities promoting exchanges and cooperation in ICT between the two states. ICT is considered a promising area where North and South could realize mutual benefits. Although the early enthusiasm has dimmed partly due to the worsening of political relations as a result of North Korea's nuclear programmes, the ICT sector is still one of the most viable options for economic cooperation between North and South Korea. There are many exchanges in software in particular.

The Hana Program Center in Dandong, a Chinese city on the border between China and North Korea, is a joint North-South software company. It has successfully completed many projects from China and South Korea by hiring programmers from North Korea. The projects include the development of CAD (computer-aided design) with Dooson Cadcam Engineering and of network software with Dasan CNS Inc. The company is also developing Linux operating systems jointly with MontaVista Software Korea, a subsidiary of a US Linux development company (*Junja Shinmun* 2 February 2004).

Furthermore, there have been many North-South joint projects in digital content development (Shin 2004). Dinga, the first 3D animation jointly produced by North and South Korean software developers, was rated highly for its quality. It got an agent contract for distribution in Japan with Media International Corporation, NHK's (Japan Broadcasting Corporation) subsidiary in entertainment. Similarly, the Little Penguin Pororo, which was broadcast on South Korea's EBS TV (Education Broadcasting System) in November 2003, was produced jointly by South Korea's EBS and North Korea's Samchonri General Company. Also, there are several mobile games in service on LG Telecom, such as Pro Beach Volleyball from Samchonri General Company. South Korea's KISTI (Korea Institute of Science and Technology Information), in collaboration with North Korea's CIAST (Central Information Agency for Science and Technology), has produced a CD-ROM titled 'Nature in Mount Baekdu'. In April 2002, Hoonnet, a South Korean company,

came out with a website jointly operated with DPR Korea Lotto (Ko 2004), which was founded by North Korea's Jangsang Trade and the Pan-Pacific Economic Development Association of Korean Nationals. This joint venture is especially significant as it is a case of economic cooperation between North and South Korea using the Internet.

## Challenges

Despite North Korea's enthusiasm, there are internal and external factors that constrain ICT development in the country (Lee and Hwang 2004). First, telecommunication and telephone networks, which are the basic infrastructure of ICT industry, remain underdeveloped. Although the situation is improving, this aspect of ICT development in North Korea is still far behind the level of global competition. Second, there is a severe lack of basic equipment. Hardware, such as computers and modems, is in short supply. Third, public Internet access is severely restricted. Fourth, advanced technology industries require a large amount of capital, which North Korea cannot afford. The necessary capital must come from foreign investors, but there is as yet no sufficient incentive for this. For example, many South Korean ICT companies are interested in North Korea for its supposedly cheap but good quality ICT workforce. However, large companies are still cautious about investing in North Korea due to political risks. The sixth constraint to ICT development in North Korea is the adverse impact of international politics such as the barring of ICT-related exports to North Korea by the Wassenaar Arrangement. Most of all, North Korea's nuclear test in October 2006 has destabilised North Korea's relations with South Korea, the USA, Japan and China, with devastating impact on its economic plans.

In sum, ICT development in North Korea faces many obstacles. It is uncertain how North Korea can cope with these internal and external challenges which are interrelated. To overcome the internal obstacles, North Korea needs significant investments for capacity building of ICT professionals and widespread provision of basic telecommunication services. Since it cannot afford to make such investments, North Korea should seek external assistance. Within the foreseeable future, however, it is unlikely for North Korea to receive such aid from the international community given the current international political climate. Unless the stalemate caused by North Korea's recent nuclear tests is broken, the challenges facing North Korea are not likely to be resolved.[1]

## Note

1. As of proofreading this article, international relations surrounding the Peninsula (for example, USA–North Korea and North–South) are rapidly improving in favour of ICT development in North Korea. For example, the second summit between North and South Korea has been announced for early October 2007. However, we have yet to see how those relations will develop both in the short and long term.

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