KJPS
Korean Journal of Policy Studies

Lee, C. (2021). National Informatization Policy in Korea: A Historical Reflection and Policy Implications. *Korean Journal of Policy Studies*, *36*(1), 27–43.

Articles

National Informatization Policy in Korea: A Historical Reflection and Policy Implications

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Keywords: policy implications, success factors, achievements and limitations, national informatization policy in korea, informatization

Vol. 36, Issue 1, 2021

This study examines, from a historical and macro perspective, the national informatization strategy that Korea has pursued over the past 40 years which laid the foundation for the rise of Korea as one of the leading countries in the digital revolution today. In particular, the informatization process is divided into five phases from the 1980s to the present, and analyzed in three aspects – main policies and plans, policy implementation system and structure, and major laws. And based on the previous research results, the success factors of informatization in Korea are discussed in terms of policy actors and institutions, policy implementation process, and policy environment. After examining the limitations of Korea's informatization policy, policy implications for developing countries are drawn in terms of policy process, policy design, and policy instruments.

INTRODUCTION

As is well known, Korea has experienced a rapid economic development, often referred to as the "Miracle of the Han River," as it grew from one of the poorest countries in the world after World War II to the world's 12th largest economy.[1] When it comes to the economic development of Korea, one may not omit the informatization and development of ICT industry. In particular, the national informatization strategy pursued by Korea since the 1980s is often mentioned as a success story, and it is worth noting as one of the important foundations for Korea's economy and society today. Although Korea has generally been successful in overcoming various challenges while it has made a leapfrogging development in the ICT sector over the last several decades, it now seems to face a turning point in a significantly changing economic and social environment as we move forward to a full-fledged transition to the era of the so-called fourth industrial revolution.

From this perspective, this paper looks at the experience of Korea's informatization policy[2] over the past 40 years. I analyze the achievements and limitations of the Korea's informatization policy and examine the main factors that led to a considerable success. Through this work, I try to derive the lessons and implications for the developing countries that the Korean experience can provide as a model case, which is also a search effort for the future direction of the Korean informatization policy.

REVIEW OF PRIOR RESEARCH AND STUDY APPROACH

There are many previous studies on the development of Korea's national informatization policy. In particular, most of the studies review the informatization process by dividing it in several phases, and they can be roughly grouped into either those dealing with informatization in a narrow sense with a focus on e-government or those examining informatization in a broader sense that includes ICT industry policy. The e-government-centered studies include D. W. Kim & Lee (1998), D. W. Kim (2003), Myung & Choi (2004), Song & Cho (2007), Song (2008), and Beschel et al. (2016), other studies from a broader perspective include Sung (2003), Hwang (2003), and Han (2009). Meanwhile, D. W. Kim & Lee (1998), D. W. Kim (2003), and Chung (2009) analyzed the historical changes of the informatization implementation system. First of all, it can be pointed out that studies dealing mainly with e-government have a narrow scope of observation which is virtually confined to e-government, although they are analyzing various aspects such as the characteristics of the e-government project, changes in the implementation system, and success factors. Next, studies that analyzed the informatization process in Korea from a broader perspective, despite the inclusiveness of their scope, have limitations in examining recent policy trends since they are covering policies up to the early 2010s.

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1 According to the World Bank, Korea ranked 12th in the world with a gross domestic product (GDP) of 1,619,424 million US$ in 2018 (The World Bank, 2020).

2 In this paper, the concept of 'informatization policy' is mainly used in a broad sense (interchangeable with 'information and communications policy') including ICT industry promotion policy and information infrastructure policy. But in some cases, the term is used in the narrow sense of 'informatization and information infrastructure policy,' parallelly used with the concept of 'ICT industry promotion policy.'

Therefore, although this study is based on the achievements of previous research, it expands the time range to cover up to mid-2020, while also dealing with informatization policy from a broader perspective including ICT industry policy as an analysis target. In addition, this paper observes from a more comprehensive perspective by conducting research on the policy process in more diverse aspects. The common point of the previous studies mentioned above is that they are discussing the history of informatization in Korea by dividing it into several phases. Although the division of phases differ depending on the time of study, they are generally divided into 3~6 phases,[3] and except for some, it is common to see the 1980s as the beginning stage of Korean informatization. In this study, I will also look at the historical development process of Korea's informatization policy from the 1980s to the present, considering that informatization was established as a meaningful policy unit at the whole government level in the 1980s. Therefore, in this study, for the sake of discussion, the development process of Korea's national informatization policy is reviewed according to five phases: (1) the period of introduction and preparation (1983~1993), (2) the period of full-scale promotion and diffusion (1994~2000), (3) the period of advancement (2001~2007), (4) the period of change and transition (2008~2012), and (5) the period of seeking a second leap (2013~present). This division of time period is centered around major policy initiatives and changes in the policy implementation system. In addition, in analyzing the development process of Korea's informatization policy, this paper will look at three aspects in each development stage, i.e., main government policies and plans, implementation system or structure, and major laws. This reflects my intention to simultaneously examine the issues of content and institutions both of which are inseparable from the policy process.

DEVELOPMENT PROCESS OF KOREA'S NATIONAL INFORMATIZATION POLICY: MAIN CONTENT AND CHARACTERISTICS

Introduction and Preparation (1983~1993): Building the National Basic Computer Network and Sprouting of the Information Society

Main Policies and Plans

It was from the 1980s when informatization policy in Korea began to be promoted as a major government agenda at the national level, which was represented by the National Basic Computer Network Project. In July 1983, the 「Basic Framework for the National Basic Computer Network Project」 was announced, and its core content was to systematically promote the computerization work such as introducing computers through categorizing it into five basic computer networks - administrative network, financial network, education and research network, national defense network, public security network - at the whole government level, which were previously carried out by individual ministries and public agencies.[4] From 1987, the 1st National Basic Computer Network Project (1987~1991) was initiated and it was a starting point for Korea to begin informatization and seek to realize the information society at the national level. In addition, the policy direction of the project was ever since adopted as a basic strategy for the national informatization policy in Korea which targeted at linking demand creation through informatization projects and expansion of supply capacity through the promotion of ICT industry.

In the meantime, in order to prepare for the information society, the 「Comprehensive Plan for Information Society」 (April 1990) was formulated. This plan, which expanded the scope of informatization into not only the central government but also local governments and the private sector, is evaluated to have become the basic framework for various informatization projects and plans promoted by the Korean government in the 1990s (H. Jung, 2007, p. 313).

Policy Implementation System and Structure[5]

In this period, the key actor was the President's Office, usually called the "Blue House" in Korea, in the beginning but later the Ministry of Communications (MOC) took the

3 For example, D. W. Kim (2003) divided the process into six periods: ① the beginning period (1978-1981), ② the preparation period for the national basic computer network project (1983-1986), ③ the first-half period of the national basic computer network project (1987-1989), ④ the second-half period of the national basic computer network project (1989-1995), ⑤ informatization projects period (1995.8-2000.12), and ⑥ e-government project period (2001-2003.7 as of present). Song (2008) divided it into three: ① initiation period (1987-1995), ② full-scale promotion period (1996-2000), and ③ advancement period (2001-2007). Meanwhile, a relatively recent study by Beschel et al. (2016) divides the Korean e-governance evolution into five stages: ① 1st Stage (1980-1995, Foundation), ② 2nd Stage (1996-2002, Full promotion), ③ 3rd Stage (2003-2007, Diffusion and advance), ④ 4th Stage (2008-2012, Integration), and ⑤ 5th Stage (2013-2017, Maturity and co-producing).

4 According to H. Jung (2007), the 「Information Industry Promotion Plan」 was prepared in March 1983, which included some content related to the public agencies' computer network, and this became the starting point for the idea of establishing a 'national basic computer network' (p. 301).

5 Regarding the changes in the implementation system during this period, H. Jung (2007) and the Ministry of Communications (1987, 1988) were mainly referred to.

lead. In June 1984, the National Basic Computer Network Coordination Committee (Chair: Chief of Staff for the President) was established in the Blue House and in September 1987, the secretariat of the committee was also established. Meanwhile, in January 1987 the National Computerization Agency (NCA), a public institution in charge of technical support for national computer networks, was established. Under the Roh Tae-woo administration (1988.2~1993.2), inaugurated after the Chun Doo-hwan administration (1980.9~1988.2), the jurisdiction of the National Basic Computer Network Project together with the secretariat of the Committee was transferred from the Blue House to the MOC in June 1989. In January 1991, the Information and Communication Bureau was established in the MOC, absorbing the secretariat of the Committee. In addition, from the 2nd National Basic Computer Network Project (1992~1996), it was implemented in a more decentralized way with the five subcommittees of the Coordination Committee for each basic computer network taking the lead.

Major Laws

The laws that became the basic frameworks for the national informatization of Korea in this period were 『Act on Deployment, Expansion, and Promotion of Utilization of Computer Network』 (1987) and 『Act on Information and Communication Research and Development』 (1991). Both laws were very meaningful in that the former established a legal basis for the National Basic Computer Network Project which has been implemented based on the president's instructions and the latter provided a very important policy tool that financially backed the informatization policy by establishing the Information and Communication Promotion Fund operated by the Minister of Communications.

Full-scale Promotion and Diffusion (1994~2000): Building the High-speed Information Infrastructure and Establishment of an Informatization Implementation System

Main Policies and Plans

In the 1990s, major countries around the world, including the United States, have begun building high-speed information infrastructures competitively.[6] Korea, catching this trend, quickly took the moment for establishing a national strategy for the 21st century information society. The starting point was the formulation of the 「Basic Plan for Building a High-speed Information and Communication Network」 (1994.3) by the MOC, which was updated as a pan-governmental plan called the 「Comprehensive Implementation Plan for Building a High-speed Information and Communication Infrastructure」 (1995.3), after the MOC was reorganized into the Ministry of Information and Communication (MIC) in December 1994. This plan aimed at establishing a high-speed, large-capacity information and communication network ("information superhighway") nationwide by 2015.[7] It was basically a successor to the National Basic Computer Network Project, but it differed in that the scope was expanded to cover not only the public sector but also individual users in the private sector and that the role of the private sector was more emphasized as a participant.

Then, in June 1996, the government-wide national informatization strategy called the 「Basic Plan for Informatization Promotion」 was announced. This was the first comprehensive blueprint for Korea to enter into an advanced information society (Ministry of Information and Communication, 2003, p. 106-107), which encompassed building high-speed information and communication network, establishing foundations for ICT industry, creating environment for informatization, and so forth. It was a very meaningful plan that provided the basis for Korea to emerge as a strong nation in terms of informatization in the early 2000s.

On the other hand, the Korean government pushed forward vigorously as a national strategy, represented by the 「Comprehensive Plan for the Development of the Information and Communications Industry」 (1996.12), to promote the ICT industry as an engine for improving national competitiveness. The Kim Dae-jung administration (1998.2~2003.2), inaugurated after the Asian financial crisis in 1997, emphasized the role of IT in recovering growth potential and providing a foothold for economic rebound. To this end, the 「CYBER KOREA 21」 (1999.3), which modified extensively the existing 1996 Basic Plan and placed a great emphasis on job creation, was formulated. In addition, the plan presented "realization of a country that uses computers the best" as one of the main projects and actively pursued nationwide IT skills training programs for citizens.

Policy Implementation System and Structure

In this period, the policy implementation system underwent major changes which had a great impact on the promotion of Korea's informatization policy over the next 10 years or so. First of all, the Korean government formed the High-speed Informatization Promotion Committee (Chair: Prime Minister) (1994.5) to build the high-speed information and communication network. In addition, a public-private joint organization responsible for establishing and executing plans, Planning Task Force for Building High-speed Information and Communication Network, was also set up within the MOC (1994.8). The most notable change of policy implementation system in this period was the creation of the Ministry of Information and Communication (MIC) in

6 Examples include the United States' "National Information Infrastructure: Agenda for Action" (September 1993), Japan's "New Social Capital Construction Plan," and the European "Trans-European Network (TEN)" (Choi et al., 1993).

7 The plan has been updated since then through two times of revision by the MIC and the target completion year was adjusted from 2015 to 2010 and again to 2005.

December 1994 by the Kim Young-sam administration (1993.2~1998.2). The MIC was created by reorganizing the former MOC through integrating the ICT-related functions of other ministries and it provided an opportunity "to set up a foundation for implementing policies on promotion of national informatization and fostering ICT industry within a comprehensive and systematic framework" (Ministry of Information and Communication, 2001, p. 565). In addition, the Planning Task Force was reorganized and expanded within the MIC as a formal unit called the Informatization Planning Office in June 1996, and this was the moment when the MIC was reborn as a central agency for national informatization truly in name and reality.

Meanwhile, the Informatization Promotion Committee (Chair: Prime Minister) as a pan-governmental coordination body was launched in April 1996 by integrating the High-speed Informatization Promotion Committee and the Computer Network Coordination Committee. Creation of the MIC and the national coordination system contributed to making informatization to emerge as a mainstream government policy and attracted national attention to the importance of informatization and the underlying information technology. In addition, in the government-wide promotion of informatization, the Presidents' interest and support played a big role. For example, Presidents Kim Young-sam and Kim Dae-jung presided over the Extended Meeting on Informatization Promotion and the Meeting on Informatization Strategy, respectively, which consolidated the will of the public and the private sectors to promote informatization and provided a driving force for mobilizing national capabilities.

Major Laws

The most important law related to informatization in this period was enactment of the 『Basic Act on Informatization Promotion』 (1996). The Act includes clauses about plans for informatization, the Informatization Promotion Committee, and the Informatization Promotion Fund.[8] In addition, it served as the basis not only for nationwide informatization implementation but also for a momentum to shift the paradigm of ICT policy from 'public sector computerization policy' or 'telecommunications policy' to 'informatization policy' (H. Jung, 2007, p. 205; National Computerization Agency, 2005, p. 83). In addition, the 『Act on the Protection of Personal Information Maintained by the Public Institutions』 was enacted (1995) to prevent infringement of privacy as the administrative computer network expanded. Meanwhile, the two laws enacted in 1999, 『Electronic Signature Act』 and 『Basic Act on Electronic Commerce』, laid the foundation for electronic transactions.

Advancement (2001~2007): Establishment of e-Government in Full Swing and IT as a Means of Economic and Social Innovation

Main Policies and Plans

The common feature of the informatization policy in the Kim Dae-jung administration and the Roh Moo-hyun administration (2003.2~2008.2) was an emphasis on the role of IT as a basis for economic and social innovation and creation of new growth engines. It was represented by strengthened recognition of e-government as a means of government innovation (S.-J. Kim, 2007; Park, 2008) and proactive measures to establish a full-fledged e-government.

Meanwhile, the 「IT839 Strategy」 (2004.2) was presented as a new IT industry development strategy, the essence of which is to organically link the 8 new services → 3 new infrastructures → 9 new growth engines according to the value chain of the IT industry (Ministry of Information and Communication, 2004). On the other hand, in this period the digital divide gradually emerged as a social issue as informatization progresses and thus the policy response to it was strengthened.[9]

Policy Implementation System and Structure

The major change in the policy implementation system during this period was to set up a separate coordinating body for the e-government sector under the direct control of the President's Office. The Kim Dae-jung administration established the Special Committee on E-government (2001.1), which meant that a top-down approach was adopted concerning e-government projects (The Special Committee on Electronic Government, 2003, p. 17). This kind of operation, on the one hand, was effective in terms of securing implementation efficiency for e-government projects involving many ministries (Chung, 2009; D. W. Kim, 2003; Myung & Choi, 2004). On the other hand, however, there were disadvantages in that the role of the Informatization Promotion Committee chaired by the Prime Minister as a regular coordinating body for informatization policies was limited by operating the Special Committee in addition to the Meeting on Informatization Strategy presided over by the President (National Computerization Agency, 2001, p. 63).

The Roh Moo-hyun administration, like the Kim Dae-jung administration, established the Expert Committee on E-government (2003.6) and later changed its name again as Special Committee on E-government (2005.6). In addition, the jurisdiction for e-government policy was transferred from the MIC to the Ministry of Government Administration and Home Affairs (MOGAHA), leaving only the technology and infrastructure-related functions with the

8 This fund is the successor to the Information and Communication Promotion Fund pursuant to the 『Act on Information and Communication Research and Development』 which was integrated into the 『Basic Act on Informatization Promotion』.

9 The pan-governmental 「Comprehensive Plan for Resolving the Digital Divide」 (2001.9) is a good example.

MIC.[10] Although this system was similar in appearance to the one of the Kim Dae-jung administration in that the work of e-government was connected with government innovation and was treated as a presidential agenda, but the status and role of the Special (Expert) Committee on E-government and administrative and financial support system for e-government were weakened (Song & Cho, 2007). And it caused conflict between the two ministries (MIC and MOGAHA) surrounding e-government policy (You & Yun, 2006).

Major Laws

The Korean government in this period made a lot of policy efforts in e-government projects, and the enactment of the 『Electronic Government Act』 (2001) provided a legal framework for those efforts. In the meantime, since the late 1990s, the spread of broadband Internet has increased the need for protection of online personal information, and accordingly, the Korean government reinforced the legal basis for protection of personal information by completely revising the 『Act on Deployment, Expansion, and Promotion of Utilization of Computer Network』 (1987) and renamed it as the 『Act on Promotion of Information and Communications Network Utilization and Information Protection, Etc.』 (2001).

Change and Transition (2008~2012): Convergence of IT and Other Industries and Dispersion of Policy Functions

Main Policies and Plans

As Korea's national informatization was entering into the advancement stage in the 2000s, the Lee Myung-bak administration (2008.2~2013.2) placed policy focus on the utilization of informatization achievements rather than informatization itself. In addition, the Lee administration emphasized convergence of IT and other industries and utilization of IT in all industries, under the recognition that the development of IT industry itself as a major growth engine has reached its limit.[11]

In terms of the ICT infrastructure, the 『Mid- to Long-Term Development Plan for Broadcasting and Communications Network』 (2009.1) was formulated but consideration of the linkages between the network and other functions such as national informatization and ICT industry promotion was weakened due to the governmental reorganization which separated each function into different agencies. Meanwhile, in the area of e-government, with the rapid spread of smartphone usage in the 2010s the policy aimed at a mobile-based smart e-government, while emphasizing policy responses to big data-related issues.

Policy Implementation System and Structure

In this period, the biggest change in the policy implementation system was abolishing the MIC, which has been the central agency in the history of Korean informatization process, and dispersing its functions into four agencies (2008.2): Ministry of Public Administration and Safety (national informatization), Ministry of Knowledge Economy (IT industry), Korea Communications Commission (broadcasting and communications network and services), and Ministry of Culture, Sports and Tourism (digital content). This reorganization caused many criticisms continuously during the Lee administration, such as confusion and conflict in the policy implementation system across the ICT policy area and the weakening of the policy coordination function (Chung, 2009; S. G. Hong, 2009).[12]

Meanwhile, the Committee on National Informatization Strategy (co-chair: Prime Minister and a private member), a public-private joint committee, was launched in November 2009 as a coordinating body, replacing the Informatization Promotion Committee. However, criticisms were made regarding the actual role and performance of the Committee (Chung, 2016; Y.-S. Lee, 2009), which I think is a problem linked to confusion due to the absence of a focal ministry in charge of ICT policy.

Major Laws

In this period, the 『Basic Act on Informatization Promotion』 was fully revised into the 『Basic Act on National Informatization』 (2009), reflecting the changes in policy orientation from 'informatization promotion' to 'utilization of knowledge and information'. Also, the 『Electronic Government Act』 was fully revised in 2010, emphasizing the use of e-government services by developing and providing administrative services demanded by the public.

In addition, the 『Information and Communications Industry Promotion Act』 (2009) was enacted for a systematic and effective implementation of IT industry promotion policy. Another noteworthy change was the enactment of the 『Personal Information Protection Act』 (2011), which replaced the 『Act on the Protection of Personal Information Maintained by the Public Institutions』 and extended the scope of personal information protection (public institutions/information processed by computers → private sector/information on paper documents).

10 Accordingly, financial support for e-government projects was transferred to each ministry's general budget, under the administrative role of the MOGAGA, instead of the informatization promotion fund operated by the MIC.

11 Plans such as 「New IT Strategy」 (2008.7) and 「Strategy for Diffusion of IT Convergence」 (2010.7) show well that perspective.

12 One such example is the controversy over the "disruption of the value chain of the IT industry" raised by the IT industry, academia, and the media. It refers to a phenomenon in which it is difficult to implement an integrated policy linking the whole value chain of the IT industry ecosystem, composed of Content-Platform-Network-Device/Terminal, because of the separation of policy functions (C-P-N-D) into different agencies.

Seeking a Second Leap Forward (2013~present): Digital Transformation toward a Hyper-connected Intelligence Society and Realignment of Policy Implementation System

Main Policies and Plans

During this period the movement to seek a second leap as a global ICT leader became active as the digital transformation and the 4th industrial revolution were emphasized. For this purpose, the Park Geun-hye administration (2013.2~2017.5) and the Moon Jae-in administration (2017.5~Present) formulated a series of comprehensive plans, such as 「The 5th Basic Plan for National Informatization (2013~2017)」 (2013.12), the 「Mid- to Long-Term Comprehensive Plan for Intelligent Information Society」 (2016.12), 「Plan for the 4th Industrial Revolution」 (2017.11), and 「The 6th Basic Plan for National Informatization (2018~2022)」 (2018.12). All these plans have in common that a strong emphasis was put on the importance of preparation for the advent of the 'hyper-connected intelligent society' and the fourth industrial revolution. In addition, the Korean government announced the 「National Strategy for Artificial Intelligence」 (2019.12) under the vision of "Beyond IT Powerhouse Toward an AI Powerhouse" and it shows the direction Korea's ICT policy geared toward. In terms of ICT infrastructure, many plans related to IoT, cloud, and blockchain have been announced by the Korean government in responding to digital transformation. With regard to the e-government policies since 2013, intelligence and the opening and use of public data have been increasingly emphasized, and recently, the Korean government has been promoting digital government innovation from the perspective of e-government responding to the era of the 4th industrial revolution and digital transformation.

On the other hand, in the area of the ICT industry during this period, a great emphasis was placed on the convergence of ICT and other sectors to create new businesses and social values,[13] while policy interest in emerging industries based on intelligent information technology, such as SW, big data, and artificial intelligence, increased significantly.[14]

Policy Implementation System and Structure

A notable change in the policy implementation system during this period is that the ICT related policy functions, which had been dispersed into four agencies in 2008, were re-integrated back into the newly established Ministry of Science, ICT and Future Planning in 2013. The Ministry was responsible for both science and technology policy and ICT policy. In the Moon Jae-in administration the Ministry of Science, ICT and Future Planning was renamed as the Ministry of Science and ICT (MSIT) in July 2017, and in August 2020 the personal information protection-related functions of the Ministry of Public Administration and Security and the Korea Communications Commission were integrated into the Personal Information Protection Commission and its status was elevated to a central administrative agency according to the 『Government Organization Act』 from a deliberative committee.

On the other hand, with regard to the coordination body for national informatization policies, the Committee on National Informatization Strategy was abolished (2013.3) and replaced (2014.5) by the Committee on Information and Communications Strategy (Chair: Prime Minister). In addition, several measures were taken to prepare for the fourth industrial revolution and the advent of the intelligent information society. The Task Force for Promotion of Intelligent Information Society was established (2016.9) in the MSIT and later it was reorganized as a bureau responsible for artificial intelligence policy (2019.11). Furthermore, the Presidential Committee on the 4th Industrial Revolution (Chair: private member), a public-private joint organization, was established in September 2017. In the area of e-government, the government's will to pursue proactive policies to open and utilize public data was emphasized by establishing the Open Data Strategy Council in December 2013.

Major Laws

During this period, a number of laws related to coping with the fourth industrial revolution and the intelligent information society were enacted or amended. These include the 『Act on Promotion of the Provision and Use of Public Data』 (2013) and the 『Special Act on Promotion of Information and Communications Technology, Activation of Convergence Thereof, Etc.』 (2014). In 2019, as part of regulatory innovation, regulatory sandbox system in the area of ICT convergence was also introduced by the revision of the Special Act.

In addition, notable revisions were also made during this period. The revision of the "Three Data Acts"[15] (2020) opened the way for industrial use of "pseudonym information", which is processed so that a specific individual could not be recognized without additional information, and reorganized the governance of personal information protection. Also, the full revision of the 『Basic Act on National Informatization』, replaced by 『Basic Act on Intelligent Informatization』 (2020), offers a legal framework for the na-

13 Plans such as the 「Basic Plan for Promotion of Information and Communications and Activation of Convergence」 (2014.5), 「K-ICT Strategy」 (2015.3), and 「5G+ Strategy for Realization of Innovative Growth」 (2019.4) indicate this feature.

14 Examples include 「SW Innovation Strategy」 (2013.10), 「Big Data Industry Development Strategy」(2013.12), 「Data Industry Activation Strategy」(2018.6), and 「Data and AI Economy Activation Plan」 (2019.1).

15 The three revised laws, dubbed "Three Data Acts" by the Korean government, are the 『Personal Information Protection Act』, 『Act on Promotion of Information and Communications Network Utilization and Information Protection, Etc.』, and 『Credit Information Use and Protection Act』.

tional promotion of the 4th industrial revolution and the transition to an intelligent information society. Meanwhile, the 『Electronic Signature Act』 was also fully revised (2020), abolishing the accredited certificate system and thereby switching the electronic signature framework from government-led to private sector-led system.

REFLECTIVE ASSESSMENT: ACHIEVEMENTS AND LIMITATIONS

In the above we looked at development process of Korea's informatization policy. Here, the achievements and limitations of informatization policy will be discussed.

Achievements of Korea's Informatization Policy

Many scholars have referred to Korea's ICT development history as a success story symbolizing Korea's economic development (e.g., Forge & Bohlin, 2008; Kelly et al., 2003; Larson, 2017; Larson & Park, 2014; Lau et al., 2005). In particular, as a result of vigorous effort to build a high-speed network initiated in the mid-1990s, Korea now possesses an excellent information and communications infrastructure.[16] In addition, Korea ranks high in other ICT related international indices as well, as indicated in Table 1 below.

In addition, the ICT industry, which the Korean government has strategically promoted along with national informatization for the past few decades, has steadily maintained its position and importance in the national economy since the 2000s. As shown in Figure 1, the Korean ICT industry has been taking the role of a major industry that leads growth and trade balance of the Korean economy. In addition, Korea tops in terms of the share of ICT goods in total trade and ranks second in terms of ICT goods exports by size after the US among the 36 OECD members as of 2017 (Korea Information Society Development Institute, 2020, p. 34-35).

Success Factors of Korea's Informatization Policy

As Korea's informatization policy has shown a considerable success especially after the 2000s, it gained reputation as an international 'best practice' or 'benchmark model,' leading to discussions about the facilitating factors of success. Looking at Korean domestic assessments, Sang-Chul Lee, former minister of the MIC, listed, in an interview, the president and government's strong drive, the concerted effort of the public and the private sectors, and reinvestment in technologies and human resources of the ICT sector through the Informatization Promotion Fund as success factors (S.-C. Lee & Lee, 2003). Daejae Jin, another former minister of the MIC, analyzed the success of "IT Korea" to be rooted in the strong informatization implementation system led by government, linkage between informatization promotion and IT industry cultivation policy, and the success of large-scale R&D projects (Ministry of Information and Communication, 2003). On the other hand, according to an ITU report, as an example of analysis by external experts, the success of Korea's ICT, especially its broadband, is attributed to such factors as Korea's high level of education, geographical characteristics including high level of urbanization and apartment-centered housing patterns, competitive environment between businesses, the active role of the government, the existence of equipment manufacturers like Samsung and LG that were able to manufacture and supply ICT products at a reasonable price, and the socio-economics of having a relatively large population compared to the level of economic development (Kelly et al., 2003).

Representative research that present a framework for discussion on the success or failure of a policy include that of Bovens and his colleagues (Bovens et al., 2001; Bovens & 't Hart, 2016) and that of McConnell and his colleague (Marsh & McConnell, 2010; McConnell, 2010, 2015a, 2015b). Bovens and his colleagues proposed a policy evaluation framework composed of two dimensions, 'program and politics'. Marsh & McConnell (2010) proposed a three-dimensional framework by adding the 'process' dimension to the framework proposed by Bovens et al. (2001), emphasizing the importance of process in policy. On the other hand, Dye (2017, p. 8) proposed the 'systems model', which shows the interaction and association between socio-economic conditions, political system, and policy. In Dye's model, the political system includes institutions, processes, and behaviors such as the separation of powers, political parties, interest groups, bureaucracy, parliament, president, and courts. This paper, while noting the respective categories and their influences on policy within the frameworks of Dye and McConnell, aims to examine the success factors of Korea's informatization policy, utilizing previous research, in terms of three dimensions, i.e., policy actors and institutions, policy implementation process, and policy environment.

Policy Actors and Institutions[17]

First of all, factors that are most frequently attributed to the success of Korea's informatization policy or ICT policy are mainly associated with policy actors and institutions.

1) The Leadership and Support of the President. National policy is heavily influenced by the official actors, with the highest decision maker being most influential. Korea's informatization policy is no exception in that there was a decisive role of the president in Korea's achieving a remarkable success and gaining global reputation. Many studies emphasize the president's leadership including the presi-

16 The ITU commended Korea's broadband as "The Korea Miracle" and cited it as a leading example (Kelly et al., 2003). Also refer to the OECD Broadband Portal (http://www.oecd.org/sti/broadband/broadband-statistics/) for Korea's leading role in broadband penetration.

17 Jackson (2010) describes the differences between three approaches of economics, sociology, and political science to institutional analysis, and suggests that all three approaches essentially converge upon the fact that "actors and institutions are co-generative" (p. 70). This paper concurs with this view, and aims to discuss both actors and institutions together.

dent's will, interest, and support for informatization as an important factor of policy success (see, e.g., Han, 2009; Jeong, 2013).[18]

18 K. Jung & Choi (2011), however, show an interesting result in their study using data from the 2007 Korean Minister Survey which collected responses from 13 ministries, not including the Ministry of Information and Communication. According to them, visionary leadership and persuasive leadership, among the five institutional leadership types (visionary, persuasive, resilient, coalition network, and maintaining), are the primary determinants of Korean ministers' perceived performance, and the effects of both types of leadership on ministerial performance are stronger when presidential support is low.

Table 1. Major ICT-related International Indices

Index Name (Evaluation Organization)	Korea's Ranking (Number of Surveyed Countries)														
	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19
ICT Development Index (ITU)[1)]	1 (180)	1 (181)	2 (154)	3 (159)	-	1 (152)	1 (155)	1 (157)	2 (166)	-	1 (167)	1 (175)	2 (176)		
Global Competitiveness Index- ICT adoption (WEF)														1 (140)	1 (141)
E-Government Development Index (UN)	5 (191)	-	-	6 (192)	-	1 (192)	-	1 (190)	-	1 (193)	-	3 (193)	-	3 (193)	
E-Participation Index (UN)	4 (191)	-	-	2 (192)	-	1 (192)	-	1 (190)	-	1 (193)	-	4 (193)	-	1 (193)	
OURdata (Open, Useful and Re-usable data Index) (OECD)											1 (30)	-	1 (31)		
World Digital Competitiveness Ranking (IMD)													19 (63)	14 (63)	10 (63)
International Digital Economy and Society Index (EC)									13 (45)	13 (45)	12 (45)	2 (45)			

Sources: MSIT, NIA, ITU, WEF, IMD, EC

1) Years of 2005 and 2006 show the results of the Digital Opportunity Index. All years from 2007 are based upon the ICT Development Index.

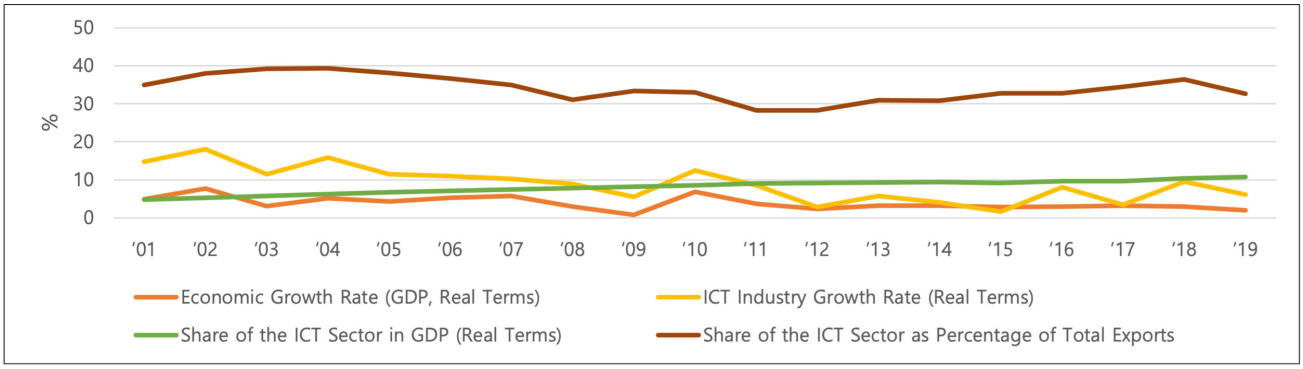

Figure 1. The ICT Industry's Contribution to the Korean Economy

Sources: Ministry of Science and ICT (2009, 2013, 2019), ITSTAT (www.itstat.go.kr), Statistics Korea (www.index.go.kr)

2) Strong Implementation System Led by Government. Another factor that is frequently cited is the active role of the government, and it is hard to explain Korea's experience in the ICT sector for the past 40 years without mentioning it. The Korean government functioned as an active policy actor while conducting a wide range of activities from formulating masterplans to such things as developing human resources and technologies, making proactive investment by government, and providing ICT skills training for citizens (Forge & Bohlin, 2008; Hwang, 2003; Kelly et al., 2003; Larson, 2017; OVUM Consulting, 2009).

When it comes to the role of the government in Korea's informatization process, two features of the implementation system stand out among others. The first is the MIC, an expert ministry created in 1994, that was charged with national informatization and ICT industry promotion. The MIC formulated and actively implemented ICT policies whilst maintaining continuity and coherence, performing a decisive role in Korea's becoming a 'Global ICT Leader'.[19] The second is the existence of a pan-governmental informatization policy coordination body whose role was important due to the extensive nature of informatization across the economy and society. The policy coordination body has been continuously maintained and developed, starting from the 1980s to the present, while it has undergone changes in name or composition.

3) Effective Use of Policy Instruments. It is important to choose the appropriate policy instruments or tools in order for a certain policy to be successful (see, for types of policy tools, Birkland, 2016, p. 322-323). Hood proposed a framework of eight types of government tools by combining the two control mechanisms-detectors and effectors-with the four basic resources that a government possesses-nodality, authority, treasure, and organization (the so-called 'NATO' scheme) (Hood, 1983; Hood & Margetts, 2007). Meanwhile, Howlett (2000, 2011, 2018) further developed Hood's discussion and conceptualized 'substantive tools' and 'procedural tools.'

Here I will focus on the two policy instruments which are deemed to have been successful in the Korea's informatization policy: laws and funding system. According to Hood's classification, each of these is classified as 'authority' and 'treasure,' respectively. According to Howlett's classification, both tools belong to the 'substantive tools.'[20] First, in terms of laws, among those various laws enacted by the Korean government to support effective ICT policy implementation, the preparation of a basic legal framework for informatization policy such as the 『Basic Act on Informatization Promotion』 in the initial phase of informatization played a crucial role in the success of Korea's informatization.

As for funding system, there were two distinct fiscal systems related to informatization. The first was the adoption of the 'Invest First, Settle Later' method, which was applied to the National Basic Computer Network Project during the 1980s.[21] Thanks to this approach, it is evaluated that the National Basic Computer Network Project was able to overcome challenges in budget, while diversifying risks entailed to the implementation of a large-scale project (Ministry of Information and Communication, 2003, p. 138). The second

19 In addition, it is worthwhile to note the roles of the NCA (National Computerization Agency: it was renamed as NIA (National Information Society Agency) in 2006), which served as the professional assistance agency for national informatization projects, KISDI (Korea Information Society Development Institute), which played a "think-tank" role in developing ICT policies, and ETRI (Electronics and Telecommunications Research Institute), which led ICT R&D. They were important partners to the MIC along the course of Korea's informatization process.

20 Discussions concerning Howlett's 'procedural tools' will be dealt with in the following 'policy process' section.

21 The 'Invest First, Settle Later' method was especially applied to the Administrative Computer Network project. The Korea Data Communications Corporation, the designated company for building the Administrative Computer Network, received funding from Korea Communications Promotion Corporation, a subsidiary company of the Korea Telecom (a public enterprise owned by government at the time), to build the network ("Invest First"). The repayment of the expenditures incurred per 'Invest First' have been made by the government agencies using the network that amortized the bill by reflecting it in the yearly budget ("Settle Later") (Ministry of Communications, 1987, p. 190).

is the 'Informatization Promotion Fund' which was consisted of contributions from telecommunications operators as well as public money. This fund became the financial foundation for the full-scale promotion of Korean informatization. In particular, having the minister of MIC, who was responsible for informatization policy, operate the fund, served as a bedrock of the so-called 'linking between planning and budgeting.' Along with this, having contributions from telecommunications operators be reinvested in the field of information and communications, instead of other areas, helped settle the virtuous circle of ICT industry development (Kelly et al., 2003; Ministry of Information and Communication, 2003).

Policy Process

Next, let's turn to the process dimension of Korea's informatization policy. Among those, I will focus on public-private cooperation and linking demand and supply policies.

1) Public-Private Cooperation. A key feature of Korea's informatization policy is that while retaining a government-led nature, a close and vibrant cooperation between the government and the private sector has been maintained in the policy process. Many studies point to public-private collaboration as one of the success factors of Korean broadband policy or informatization policy (H. Jung, 2007; Kelly et al., 2003; Lau et al., 2005; OVUM Consulting, 2009).[22] In the case of Korea, a very close public-private cooperation is witnessed not only in the policy formulation process, but also in the policy implementation process. In general, extensive participation of civilian experts and accommodating policy demands from industrial circles took place in the policy formulation process: e.g., policy coordination bodies serving as a joint forum for public-private policy discussion.[23] And in the policy implementation process, the private sector played a more active role in response to the government's policy vision and objectives: e.g., active investment by companies responding to the government's competition policy toward broadband.

Another notable characteristic involving public-private collaboration is the support from the media. The media's favorable attitudes to the government's informatization policy along with voluntary informatization campaigns[24] considerably contributed in gaining support from the National Assembly (Editorial Committee for Economic Miracles by Hearing Firsthand, 2019, p. 244). This cooperative government-media relationship during the early period of Korean informatization process is a rare case, considering the usual government-media relationship in a democratic country.

2) The Linkage and Parallel Implementation of Demand and Supply Policies. During the course of Korea's informatization process, linking both demand and supply sides of policy is another success factor that is often referred to (H. Lee et al., 2003; OVUM Consulting, 2009; Picot & Wernick, 2007). That is, policies such as building a large-scale national administrative computer network, implementing e-government projects, and raising awareness of informatization facilitated demand for the entire ICT industry, thereby enhancing the supply capability of ICT sector. In turn the profit made from the ICT industry was reinvested in the informatization sector, completing the virtuous circle of 'informatization (demand) - ICT industry promotion (supply) - reinvestment in informatization (recreation of demand).'

Policy Environment

Lastly, in terms of policy environment, Korea's socio-cultural characteristics and geographic and demographic factors are frequent subjects of reference. During the late 1990s to the mid-2000s, ICT skills training for the general public, including the disabled, senior citizens, and housewives, significantly contributed to the rapid diffusion of broadband through stimulating demand for informatization. Other researchers also look to the importance of education in Korea's success in ICT (Forge & Bohlin, 2008; Larson, 2017), and under the influence of Confucian culture, the fact that the Korean society traditionally attached high respect and value to education, and the fact that parents have great educational fervor for their children played a role as well (Forge & Bohlin, 2008; H. Lee et al., 2003). The fusion of the informatization and these socio-cultural characteristics led to Koreans' high curiosity for 'newness' and receptive attitude toward new technologies and services. Other influencing factors, especially connected to the rapid spread of broadband, include geographic and demographic aspects (Kelly et al., 2003; H. Lee et al., 2003), such as a large population compared to a relatively small land size and the apartment-centered housing patterns of high density, which enabled cost-effective deployment of broadband infrastructure and high service accessibility for users.

The Limitations and Problems of the Korean Informatization Policy

Despite the impressive accomplishments of the Korean informatization policy since the 1980s, the fruits were not

22 Falch & Henten (2010) and Frieden (2005) also underline, through comparative analysis between countries, that public-private cooperation in ICT development is an important factor.

23 According to the study of J. Lee (2016), institutionalized participatory governance such as advisory committees which increases trust between government agencies and social policy stakeholders is more effective in improving policy performance than noninstitutionalized governance methods such as public meetings.

24 In March, 1995, Chosun Ilbo, one of the major newspapers, put out the catchphrase 'We were late for industrialization, but let's lead informatization' and proclaimed an informatization campaign. In January, 1997, Chosun Ilbo and Donga Ilbo, the two most influential newspapers at the time, jointly published 10 articles of informatization campaign series, contributing to raising national awareness of and interest in informatization (Ryu, 2014; Ryu & Jang, 2014).

always sweet. First, the process of Korean informatization policy has a strong tendency of government's leading. It was especially true for the 1980s and 1990s during the early phase of informatization. After the 2000s, albeit almost all areas of economic policy aiming to follow the 'Private Sector Leads – Government Supports' framework, it seems that in practice the role of the private sector is still limited in setting policy agenda or policy making process. The government-led approach may have been effective in the past when the technological level of the private sector was low and the size of the economy was relatively small, however, with a changing and complex environment, the government's capacity has its own limitations. Moving forward, there is a necessity for the increasing role of the private sector.

Second, Korea's informatization policy tended to be suppliers-centric. During the informatization process, supplier-centric policy decisions were made and implemented mostly through consultations between the government and the industrial circle, rather than the citizens or individual consumers. Song (2008) also noted that the greatest problem of past informatization projects was the underutilization of service resulting from informatization being implemented with the convenience of suppliers in mind rather than customer satisfaction.

Third, the imbalance between ICT industry subsectors is another problem. Research (J. P. Hong et al., 2016; Larson, 2017) highlight that Korea's ICT industry development is centered on hardware and networks, with software and service sectors being weak points. For example, while the HW to SW ratio in the world ICT market in 2018 is 23.4% : 36.9%, Korea's ratio in the domestic ICT production is 73.5% : 11.2%, showing the weakness of SW (Ministry of Science and ICT, 2019b, p. 28-29). Moreover, in 2017, the share of small- and medium-sized businesses in the ICT production is only 20.4%. Despite the Korean government's efforts, the problem of HW and big businesses-centered ICT industry structure remains a major limitation and challenge to overcome.

DISCUSSION AND POLICY IMPLICATIONS

This paper reviewed the history and process of Korea's informatization policy starting from the 1980s, along with its attainments and limitations. Under the recognition that the Korean case should be understood in the context of Korea's specific political, economic, social, and cultural environment, I wish to derive some policy implications for developing countries in the following, in terms of policy process, policy design, and policy instruments.

First, in terms of policy process, Korea's national informatization displays the characteristic of a government-led model. A well-known discussion concerning the role of state or government in economic development is the 'developmental state' theory proposed by Johnson in the early 1980s (Johnson, 1982). Albeit the differences in specifics between Japan and Korea, it can be argued that Johnson's model provides useful insights for explaining Korea's informatization process.[25] Larson & Park (2014) used the four features presented in Johnson's model to explain Korea's ICT led development process after the 1980s, and highlighted the governmental leadership, specifically the role of MIC as the policy 'control tower' in the ICT sector.

Meanwhile, there also exists the 'entrepreneurial state' model that takes a different angle in explanation, albeit having similarities with the developmental state model in that it emphasizes the role of state in economic development (Ebner, 2009; Yu, 1997, 2001). Mazzucato emphasizes the role of state especially in technological innovation, from the perspective of the entrepreneurial state model (Mazzucato, 2013). According to Mazzucato, the state has a role not only in market fixing but also in market shaping. Applying Mazzucato's discussion to the Korean case, as an 'entrepreneurial state,' the Korean government shared risks with the private sector and created the initial demand for the ICT industry in the informatization process, through activities such as various technology R&D projects (e.g., TDX and CDMA), and large-scale investment in infrastructures including e-government.

Then what implications does Korea's experience have for developing countries? Considering that policy design essentially has 'contextual orientation,' (Howlett, 2011), in order to effectively accomplish policy objectives, it is necessary to continuously review and improve policy implementation process and system in a way that fits the given nation's policy environment. In the case of Korea, during the initial phase of informatization, the role of the government was far larger than today, but as progress being made its role has been gradually reduced while the role of the private sector grew larger. The lesson that we need to learn from the developmental state model and the entrepreneurial state model is that, although the 'extent' of government's role is important, the substance and method of role execution, i.e., the 'what' and 'how,' should be more important items for consideration, depending on the country's development stage and the environment it faces.

Another fundamental implication that is derived from the Korean experience concerning the role of government in the policy process is the importance of political leadership[26] and the consistency of government policy with a clear vision. Considering that a comparatively long-term timeframe is necessary in order for investment in the ICT sector to be realized with innovative results, political leadership and policy consistency is an essential factor for the suc-

25 According to Johnson, four essential features of the Japanese developmental state model are ① the existence of an elite bureaucracy, ② a political system that allows the effective operation of bureaucracy, ③ market-conforming methods of state intervention in the economy, and ④ a pilot organization like MITI (Ministry of International Trade and Industry) (Johnson, 1982, p. 315-320). It seems possible to apply the model to Korea's informatization policy if MITI is replaced by the MIC of Korea in the fourth feature of Johnson's analysis.

26 Weiss (2010, p. 198) also emphasizes the importance of 'political will' as a 'common ingredient' in developmental states.

cess of ICT policy. Yet another lesson that the Korean case provides concerning policy process is that the building of a cooperative public-private partnership is an important factor that influences the long-term success of ICT policy. In this regard, the concept of "collaborative governance" presented by Ansell (2012) and Ansell & Gash (2008) is noteworthy. The public-private cooperation is increasingly gaining importance in modern governance, where 'procedural' policy tools have become necessary as well as the traditional 'substantive' policy tools in the state-society interaction (Howlett, 2000).

Second, it deserves attention that, in terms of policy design,[27] Korea's informatization policy set a policy mix to achieve the policy goal to become a 'global ICT leader' and chose effective policy instruments to realize it. As examined earlier, Korea's informatization policy has the characteristic of 'linkage between demand and supply,' which included policies for both informatization promotion and ICT industry cultivation. It seems important for developing countries in designing ICT policy to keep a balanced perspective to reflect diverse social values and set a policy mix in a way that best suits the country's needs.

Third and last, as policy design is related to both policy formulation and policy implementation (Howlett, 2011), the key of policy design is selecting the optimal tools to achieve policy objectives. In light of policy tools, it could be argued that Korea achieved great success in utilizing various substantial and procedural policy tools (e.g., ICT training, effective legal frameworks, the Informatization Promotion Fund, expert ministry like MIC, and high-level policy coordination bodies) to compose an effective policy mix. It should be noted that, as Korea's experience indicates, the governments of developing countries are tasked with choosing the optimal policy tools and that this is eventually a factor directly linked to the success of policy.

Funding

This research received no external funding.

Conflicts of Interest

The author declares no conflict of interest.

Note

The views and opinions expressed herein are those of the author and do not necessarily reflect the official policy or position of the Ministry of Science and ICT.

Submitted: December 03, 2020 KST, Accepted: February 04, 2021 KST

27 According to Schneider (2015), policy design is conceptualized as a 'verb' referring to the public policy formulation process, or as a 'noun' describing the content of public policy. As the concept of policy design as a 'verb' was discussed in relation to the policy process above, here, I use the term as a 'noun' that describes the content of policy.

REFERENCES

Ansell, C. (2012). Collaborative governance. In D. Levi-Faur (Ed.), *The Oxford handbook of governance* (pp. 498–511). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199560530.013.0035

Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, *18*(4), 543–571. https://doi.org/10.1093/jopart/mum032

Beschel, R. P., Jr., Kim, S., & Choi, C. (2016). Digital government in developing countries: Reflections on the Korean experience. In T. G. Karippacheril, S. Kim, R. P. Beschel Jr., & C. Choi (Eds.), *Bringing government into the 21st century: The Korean digital governance experience* (pp. 1–11). World Bank. https://doi.org/10.1596/978-1-4648-0881-4

Birkland, T. A. (2016). *An introduction to the policy process: Theories, concepts, and models of public policy making* (4th ed.). Routledge. https://doi.org/10.4324/9781315717371

Bovens, M., & 't Hart, P. (2016). Revisiting the study of policy failures. *Journal of European Public Policy*, *23*(5), 653–666. https://doi.org/10.1080/13501763.2015.1127273

Bovens, M., 't Hart, P., & Peters, B. G. (2001). Analyzing governance success and failure in six European states. In M. Bovens, P. 't Hart, & B. G. Peters (Eds.), *Success and failure in public governance: A comparative analysis* (pp. 12–26). Edward Elgar Publishing Limited. https://doi.org/10.4337/9781843762850

Choi, T., Ha, W., Lee, S., Hyun, C., Wu, W., Chun, J., & Lim, D. (1993). *Establishment plan and implementation strategy for the Korean information and communications infrastructure under a competitive system (I)*. Electronics and Telecommunications Research Institute.

Chung, C.-S. (2009). A critical review of the national informatization promotion system: Focusing on the changes of the promotion system. *Journal of Korean Association for Regional Information Society*, *12*(4), 39–66.

Chung, C.-S. (2016). E-government: Lessons from the lost ten years. *Proceedings of the Korean Association for Public Administration Conference*, 981–1032.

Dye, T. (2017). *Understanding public policy* (15th ed.). Pearson.

Ebner, A. (2009). Entrepreneurial state: The Schumpeterian theory of industrial policy and the East Asian "Miracle." In U. Cantner, J.-L. Gaffard, & L. Nesta (Eds.), *Schumpeterian perspectives on innovation, competition and growth* (pp. 369–390). Springer. https://doi.org/10.1007/978-3-540-93777-7_20

Editorial Committee for Economic Miracles by Hearing Firsthand. (2019). *Establishing a venture ecosystem of adventure and innovation: the growth history of Korean venture businesses (Korean Miracle 5)*. Nanam Publishing House.

European Commission. (2018). *International digital economy and society index 2018*. https://ec.europa.eu/knowledge4policy/publication/international-digital-economy- society-index-2018_en

Falch, M., & Henten, A. (2010). Public private partnerships as a tool for stimulating investments in broadband. *Telecommunications Policy*, *34*(9), 496–504. https://doi.org/10.1016/j.telpol.2010.07.010

Forge, S., & Bohlin, E. (2008). Managed innovation in Korea in telecommunications – Moving towards 4G mobile at a national level. *Telematics and Informatics*, *25*(4), 292–308. https://doi.org/10.1016/j.tele.2007.10.002

Frieden, R. (2005). Lessons from broadband development in Canada, Japan, Korea and the United States. *Telecommunications Policy*, *29*(8), 595–613. https://doi.org/10.1016/j.telpol.2005.06.002

Han, S. (2009). A study on informatization policy in Korea: Policy change and prospect. *Public Policy Review*, *23*(2), 5–33. https://doi.org/10.17327/IPPA.2009.23.2.001

Hong, J. P., Byun, J. E., & Kim, P. R. (2016). Structural changes and growth factors of the ICT industry in Korea: 1995–2009. *Telecommunications Policy*, *40*(5), 502–513. https://doi.org/10.1016/j.telpol.2015.08.001

Hong, S. G. (2009). IT policy system of the Lee Myung-bak government. *Informatization Policy*, *16*(4), 27–48.

Hood, C. C. (1983). *The tools of government*. The Macmillan Press Ltd.

Hood, C. C., & Margetts, H. Z. (2007). *The tools of government in the digital age*. Palgrave Macmillan.

Howlett, M. (2000). Managing the "hollow state": Procedural policy instruments and modern governance. *Canadian Public Administration/ Administration Publique Du Canada*, *43*(4), 412–431. https://doi.org/10.1111/j.1754-7121.2000.tb01152.x

Howlett, M. (2011). *Designing public policies: Principles and instruments*. Routledge.

Howlett, M. (2018). Policy instruments and policy design choices: Selecting substantive and procedural tools in public policymaking. In M. Howlett & I. Mukherjee (Eds.), *Routledge handbook of policy design* (pp. 77–86). Routledge. https://doi.org/10.4324/9781351252928-5

Hwang, J.-S. (2003). Information policy structure and issues of Korea. *International Telecommunications Policy Review*, *10*(2), 99–120.

IMD. (n.d.). *World digital competitiveness ranking (2017, 2018, 2019)*. https://www.imd.org/wcc/world-competitiveness-center/

International Telecommunication Union. (n.d.-a). *Measuring the information society report (2009-2018)*. https://www.itu.int/pub/D-IND-ICTOI

International Telecommunication Union. (n.d.-b). *World information society report (2006, 2007)*. http://handle.itu.int/11.1002/pub/80117c57-en

Jackson, G. (2010). Actors and institutions. In G. Morgan, J. L. Campbell, C. Crouch, & O. K. Pedersen (Eds.), *The Oxford handbook of comparative institutional analysis* (pp. 63–86). Oxford University Press.

Jeong, J. W. (2013). A study on strategies for improving informatization performance in Korea, drawing on international best practices. *Korean Society and Public Administration*, *23*(4), 1–29.

Johnson, C. (1982). *MITI and the Japanese miracle: The growth of industrial policy, 1925-1975*. Stanford University Press.

Jung, H. (2007). *20 years of Korean IT policy: From the thousand-dollar era to the ten-thousand-dollar era*. Electronic Times.

Jung, K., & Choi, J. (2011). Institutional leadership and perceived performance: Evidence from the Korean Minister Survey. *The Korean Journal of Policy Studies*, *26*(2), 45–75.

Kelly, T., Gray, V., & Minges, M. (2003). *Broadband Korea: Internet case study*. International Telecommunication Union. http://www.itu.int/ITU-D/ict/cs/korea/material/CS_Kor.pdf

Kim, D. W. (2003). The changes of organizational system for national informatization. *Proceedings of the Seoul Association for Public Administration Conference*, 76–98.

Kim, D. W., & Lee, W. H. (1998). Organizational system for national informatization policy. *Korean Public Administration Review*, *32*(2), 19–37.

Kim, S.-J. (2007). The Participatory Government's e-government: Performance and future tasks. *Journal of Korean Association for Regional Information Society*, *10*(4), 111–134.

Korea Information Society Development Institute. (2020). *2020 ICT industry outlook of Korea*.

Larson, J. F. (2017). Network-centric digital development in Korea: Origins, growth and prospects. *Telecommunications Policy*, *41*(10), 916–930. https://doi.org/10.1016/j.telpol.2017.03.007

Larson, J. F., & Park, J. (2014). From developmental to network state: Government restructuring and ICT-led innovation in Korea. *Telecommunications Policy*, *38*(4), 344–359. https://doi.org/10.1016/j.telpol.2013.10.001

Lau, T. Y., Kim, S. W., & Atkin, D. (2005). An examination of factors contributing to South Korea's global leadership in broadband adoption. *Telematics and Informatics*, *22*(4), 349–359. https://doi.org/10.1016/j.tele.2004.11.004

Lee, H., O'Keefe, R. M., & Yun, K. (2003). The growth of broadband and electronic commerce in South Korea: Contributing factors. *The Information Society*, *19*(1), 81–93.

Lee, J. (2016). Designed to succeed: Participatory governance, transaction cost, and policy performance. *The Korean Journal of Policy Studies*, *31*(2), 1–22.

Lee, S.-C., & Lee, S. M. (2003). Information and Communication Minister Sang-Chul Lee on building e-Korea. *Academy of Management Perspectives*, *17*(2), 19–23. https://doi.org/10.5465/ame.2003.10025181

Lee, Y.-S. (2009). A critical review of the Lee Myung-bak administration's basic and action plans for national informatization. *Journal of Korean Association for Regional Information Society*, *12*(4), 1–38.

Marsh, D., & McConnell, A. (2010). Towards a framework for establishing policy success. *Public Administration*, *88*(2), 564–583. https://doi.org/10.1111/j.1467-9299.2009.01803.x

Mazzucato, M. (2013). *The entrepreneurial state: Debunking public vs. private sector myths*. Anthem Press.

McConnell, A. (2010). Policy success, policy failure and grey areas in-between. *Journal of Public Policy*, *30*(3), 345–362. https://doi.org/10.1017/s0143814x10000152

McConnell, A. (2015a). Learning from success and failure? In E. Araral Jr., S. Fritzen, M. Howlett, M. Ramesh, & X. Wu (Eds.), *Routledge handbook of public policy* (pp. 484–494). Routledge.

McConnell, A. (2015b). What is policy failure? A primer to help navigate the maze. *Public Policy and Administration*, *30*(3–4), 221–242. https://doi.org/10.1177/0952076714565416

Ministry of Communications. (n.d.). *Annual report on telecommunications (1987, 1988)*.

Ministry of Information and Communication. (2001). *History of the Korean information and communication in the 20th century*.

Ministry of Information and Communication. (2003). *The Korean informatization strategy*.

Ministry of Information and Communication. (2004). *IT839 Strategy*.

Ministry of Science and ICT. (n.d.-a). *Annual report on national informatization (1996-2019a)*.

Ministry of Science and ICT. (n.d.-b). *Annual report on the promotion of the Korean ICT industry (2009, 2013a, 2019b)*.

Ministry of Science and ICT. (n.d.-c). *ITSTAT (IT Statistics of Korea)*. http://www.itstat.go.kr

Myung, S., & Choi, Y. (2004). E-government promotion process and its criticism: Diagnosis and improvement measures for major issues. *Proceedings of the Korean Association for Public Administration Conference*, 404–424.

National Computerization Agency. (2005). *Past and Present of Korea's IT Policy*.

National Computerization Agency/National Information Society Agency. (n.d.). *National informatization white paper (1993-2019)*.

OVUM Consulting. (2009). *Broadband policy development in the Republic of Korea*. https://www.infodev.org/infodev-files/resource/InfodevDocuments_934.pdf

Park, M. J. (2008). The evaluation about electronic government project's driving system and strategy: Focused on the Participatory Government. *Korean Public Management Review*, *22*(1), 199–240. https://doi.org/10.24210/KAPM.2008.22.1.009

Picot, A., & Wernick, C. (2007). The role of government in broadband access. *Telecommunications Policy*, *31*(10–11), 660–674.

Ryu, H. (2014, June 16). 20 Years of popularization of Internet in Korea (1): A leading figure in the informatization movement, Ahn Byung-hoon, Chairman of Seo Jae-pil Memorial Foundation. *Chosun Biz*. https://biz.chosun.com/site/data/html_dir/2014/06/16/2014061602283.html

Ryu, H., & Jang, W. (2014, July 1). 20 Years of popularization of Internet in Korea (2): Grand designer of informatization, Oh Myung, Former Deputy Prime Minister and Minister of Science and Technology. *Chosun Biz*. https://biz.chosun.com/site/data/html_dir/2014/07/01/2014070101399.html

Schneider, A. (2015). Policy design and transfer. In E. Araral Jr., S. Fritzen, M. Howlett, M. Ramesh, & X. Wu (Eds.), *Routledge handbook of public policy* (pp. 217–228). Routledge.

Song, H. J. (2008). A historical reflection of informatization policy and future tasks. *Journal of Korean Association for Regional Information Society*, *11*(1), 1–15.

Song, H. J., & Cho, T. (2007). Electronic government of Korea: Performance and tasks. *Informatization Policy*, *14*(4), 20–37.

Statistics Korea. (n.d.). *E-national index*. https://www.index.go.kr/main.do

Sung, N. (2003). Informatization policies and strategies in Korea: History, performance and tasks. *International Telecommunications Policy Review*, *10*(2), 1–35.

The Special Committee on Electronic Government. (2003). *Whitepaper on electronic government*.

The World Bank. (2020). *World development indicators* [Data set]. https://databank.worldbank.org/source/world-development-indicators

Weiss, L. (2010). The state in the economy: Neoliberal or neoactivist? In G. Morgan, J. L. Campbell, C. Crouch, O. K. Pedersen, & R. Whitley (Eds.), *The Oxford handbook of comparative institutional analysis* (pp. 183–209). Oxford University Press.

World Economic Forum. (2018). *The global competitiveness report (2018, 2019)*. https://www.weforum.org/reports

You, H. L., & Yun, S.-O. (2006). An analysis of conflict between ministries in the process of e-government promotion: Focusing on conflict between the Ministry of Government Administration and Home Affairs and the Ministry of Information and Communication. *Korean Policy Sciences Review*, *10*(4), 397–420.

Yu, T. F.-L. (1997). Entrepreneurial state: The role of government in the economic development of the Asian newly industrialising economies. *Development Policy Review*, *15*(1), 47–64. https://doi.org/10.1111/1467-7679.00025

Yu, T. F.-L. (2001). Towards a theory of the entrepreneurial state. *International Journal of Social Economics*, *28*(9), 752–766. https://doi.org/10.1108/EUM0000000005692