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Evolution to Digital Government through Intelligent Government in Korea

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ABSTRACT

The Fourth Industrial Revolution can be summarized as the evolution of a connected and more intelligent society. Moreover, intelligence information technology is the driving force of change as the industry's fundamental structural changes. The intelligence government is one of the digital governments that the Korean e-Government aims for. Korea is one of the leading e-government countries in the world. It is responsible for leading and disseminating e-government around the world, especially in the developing world. In this paper, we discuss the stages of change, strategies, efforts, and examples from the Korean e-government to intelligent government, present guidelines, and discuss future development directions.

Keywords: Intelligent Government; Big Data; Transformation; e-Government.

INTRODUCTION

The Fourth Industrial Revolution can be summarized as the evolution of a connected and more intelligent society. As a result of examining the approach trends of the 4th Industrial Revolution in domestic and foreign countries, it can be seen that the communication infrastructure that connects all objects to the network is established, and the economic system. The industrial structure is optimized, leading to the industrial revolution based on the strength of the country.

Moreover, intelligence information technology is the driving force of change as the industry's fundamental structural changes. Korea is one of the leading e-government countries in the world. It is responsible for leading and disseminating e-government around the world, especially in the developing world. Furthermore, Korea must establish and spread future e-government development in response to the Fourth Industrial Revolution. The essential thing in this process is to achieve administrative innovation through the electronic government.

The role of ICTs has dramatically changed over the past decade. Governments are attempting to revitalize their public administration, make it more proactive, more efficient, more accountable, more service-oriented, and closer to the people. To accomplish this transformation, governments are introducing innovations in their organizational structure, practices, capacities, and how they mobilize, deploy and utilize the human, material, information, technological and financial resources for service delivery to remote, disadvantaged, and challenged people.

As a leading country of e-Government services, Korea's e-Government is transforming into intelligence government services. The Korean government places citizens at the heart of all public services. It provides individual citizens with public services customized to their characteristics and life cycles. (Figure 1)

With the development of intelligent information technology, the e-government paradigm is shifting. As intelligent information technologies such as IoT, cloud, big data, and AI across society are accelerating, a new e-government strategy is required to support this.

With the advent of the 4th industrial revolution, it is necessary to create new added value through convergence between technologies, services, and industries (Nexus) and create an e-government ecosystem that promotes this. The way we live and work through the interaction of different machines, people, and industries. A new wave of using cutting-edge technology has begun.

However, personalized, integrated services without time and space constraints through mobile, online, and offline channel integration (O2O), public-private collaboration, etc., are still insufficient. The seamlessly integrated business processing environment through linkage and integration of tasks and functions without borders between ministries and real-time information sharing is immature, and social and economic costs are incurred.

Also, the lack of response to new security threats caused by the spread of new technologies such as IoT, cloud, and artificial intelligence (AI) has made it insufficient to secure public trust in e-government. The linkage between fostering and developing industries and job creation through e-government, such as fostering new ICT industries, supporting corporate activities, and creating jobs, is also insufficient. The lack of global leadership in line with the world's No. 1 e-government status is pointed out as a problem due to the focus on international cooperation and overseas exports centered on e-government latecomers.

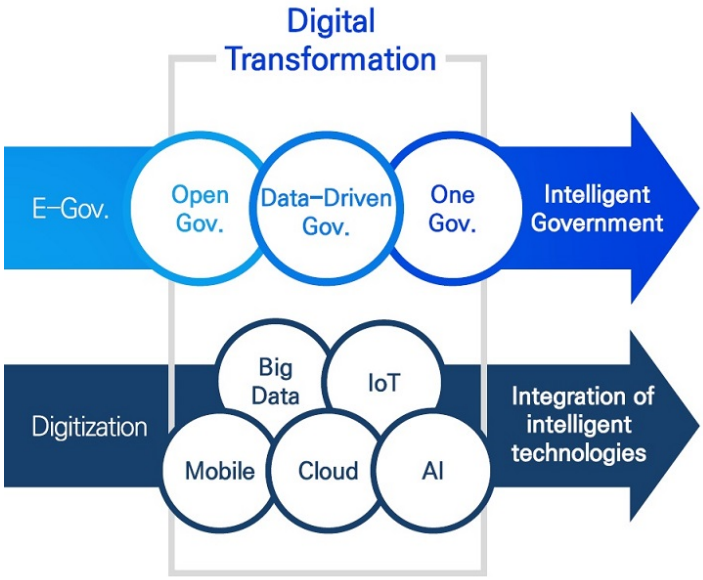


Figure 1. Intelligent government through Digital Transformation (NIA, 2019)

More complex and challenging social issues are increasing due to the demands for e-Government. Problem-solving capabilities based on public-private collaboration are required to resolve various social issues such as low birthrate, aging population, low growth, increasing youth unemployment rate, and social polarization. Also, the improvement of national happiness and personal quality of life is highlighted as significant values. It emphasizes social, environmental, and economic sustainable development to perpetuate the present and the future.

The administrative paradigm is changing according to the government 3.0 promotion. The e-government is re-recognized as an essential strategic tool for government innovation, and the importance of government 3.0 has been recognizing. Also, essential administrative services need to be redesigned to meet the public's perspective, such as increasing public awareness, various individual needs, and upgrading and diversifying public services. The United States, the United Kingdom, and Australia are pushing forward next-generation e-government strategies that focus on creating people's value, reflecting the change in the administrative/ICT paradigm, overcoming the growth limitations of the existing e-government.

In response to these changes, the Korean government changes to an intelligent government that applies the 4th industrial revolution technologies such as artificial intelligence and big data analysis in Figure 1. This study discusses the transformation of the Korean e-government and the development strategy and direction of the intelligent e-government.

BACKGROUND

The Fourth Industrial Revolution drives a new phase of globalization, such as the developing ICT and the popularization of smartphones, creating IT-intensive sectors based on big data. A new sharing economy is emerging and is fueled by higher degrees of open data, collaboration, and citizen involvement. Simultaneously, citizens' needs and expectations are evolving, particularly regarding welfare, education, employment, and the environment.

Intelligent IT refers to technology that is capable of performing the highly complex functions of human intelligence by combining the "intelligence" of artificial intelligence (AI) with the "information" provided by data-processing and network technologies, such as the Internet of Things (IoT), cloud computing, big data analysis, and mobile technologies.

Change to Digital Society with Big Data

New information and communication technologies, such as IoT, cloud, big data, and mobile, are at the heart of these services. Statistics show that with the spread of IoT, the number of objects connected to each person has increased and will continue. Many countries now use mobile means for communication between the government and citizens. These means are most commonly used for G4C service, delivery of situational information, and public elections.

As a by-product of the hyper-connected convergence trend, the global economy is also evolving to fully embrace the sharing economy. When the sharing economy becomes part of our daily lives, more businesses will capitalize on the opportunity to use resources and services efficiently. Even though there has been significant technology development and economic growth, citizens are not as satisfied or happy as they could be.

The investment in ICT to enhance the services delivery of the public sector and engaging with internal and external entities has started with e-government initiatives and projects which focused on enhancing the public service transparency, collaboration, e-participation, and efficiency (Vincenzo, 2015).

Electronic transformation for the government services using ICT is considered a complicated and costly task, usually associated with the computerization of public services and business systems. It needs to formulate legislation and policies to enhance the quality, data accuracy, privacy, security, and control of e-government data.00

Big data can enhance decision-making and enhance the organization's efficiency and effectiveness, but only if organizations use a scientific method to understand the data. Big data can reduce costs such as new information technologies, improve the time required to make computing processes, and deliver high-quality new services and products that meet the demands. It can also improve internal business decisions, such as traditional analysis. The concepts of the technologies behind big data allow organizations to achieve various aims and objectives.0

Big data will become one of the most potent investment sectors for the government. E-Government can use big data to discover the trends and patterns of peoples' behavior on social networking to provide better, effective, efficient service. The term Big Data offers new opportunities for value creation, discovery, prediction, and empower the business intelligence for decision support in e-government.0

Since the public sector starts their online transactions and activities, the e-government initiatives adopt the big data strategies in their next implementation. Big data provides the government with a better understanding of their people's habits and interests with mobile and social networking applications based on their browsing, clicks, search engines, purchase histories, booking, etc. With these capabilities, the government can understand its people's habits, tastes, personalities, and preferences, which can help predict what their people want and offer appropriate advertising and programs to satisfy their needs and concerns.0 Big data helps the government structure smart government by providing faster, effective, and reliable services to its citizens.0

Big data is a new concept and powerful technology used to define various data's growth and availability in public sectors. E-government can brief service delivery and offer higher speed, transparency, effectiveness, efficiency, and certainty. Big data has the power to transform e-government practices in generating added value for public services and can motivate and support the digital innovation for e-government.00

With enhanced e-government services and increasing effectiveness and efficiency, big data's added values are explored in business analysis. The big data is also discussed in identical administration structures about integrating various information sources, security risk, and digital confidentiality. The viewpoint research directions are specified in big data issues for the public sector. 00

E-government does not need big data. It needs the right big data. Big data is delivering meaningful value to e-government as a new revolution that leads the entire ICT agency. The new activities and valued data are being generated faster than ever before. These big data hold the key to unlock a

new race of activities that will make both the government and the public understand the business to make it more effective and efficient. Many leaders defined Big Data as the next edge for innovation, productivity, competition, and quality.00

The main principle of big data is valuing predictions, and it optimizes abilities and rules that create value to support data management. Big data is available in various structures and formats, and it can be used for different objectives, such as predicting a search keyword or social networking activities. The e-government initiative needs to recognize the importance of big data management, benefits, analysis, and technologies into its strategic e-government plan.0

The 4th Industrial Revolution and e-Government Development

In the Fourth Industrial Revolution, intelligence information technology is the driving force of change as the industry's fundamental structural changes. E-government is evolving with the continuous evolution of information and communication technologies (ICTs) such as mobile and ubiquitous.0 There are many different models of e-government evolution.0000 Each model proposes specific names and different phases: the information phase, the interaction phase, the transaction phase, and the integration phase. 0 discuss that e-government evolves through four stages of development: their integration and technological and organizational complexity. (Figure 2)

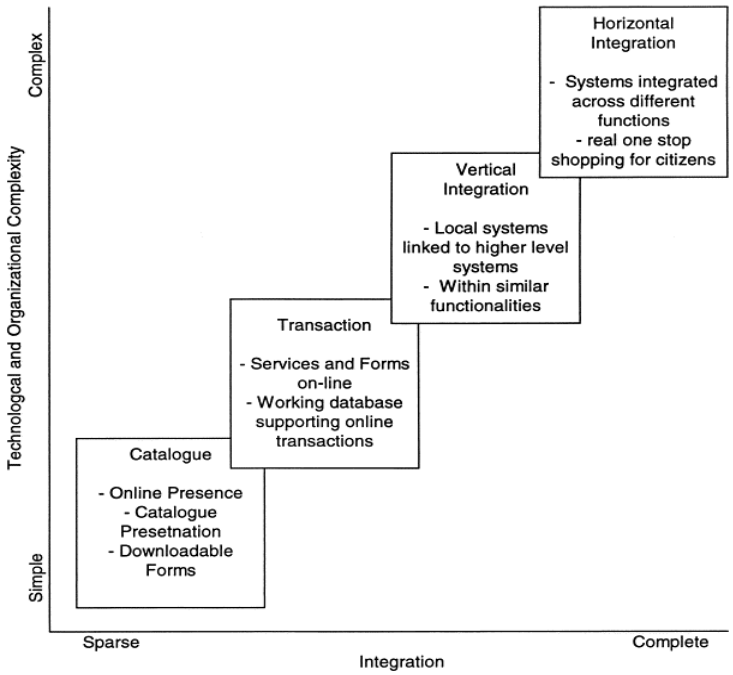


Figure 2. Dimensions and stages of e-government development

The first stage is cataloging, providing government information by creating government agency Web sites. At this stage, only one-way communication between the government and the governed is possible. The second stage is a transaction. Agencies at this stage can provide online transactions with government agencies. This stage makes two-way communications possible. The cataloging and transaction stages focus on creating an electronic interface for government information and

services. The third stage is the integration of government operations within functional areas in government. Agencies working in the same functional area integrate their online operations. The final stage is horizontal integration. Different functional areas are integrated within the same electronic system and put to use through a central portal. The last two stages focus on integrating the provision of e-government activities within the existing governmental structure.

0 proposes four general stages of e-government transformation: the billboard stages, the partial service delivery stages, the portal stages, and interactive democracy with public outreach and accountability enhancing features. The cultivation phase 1 protects horizontal and vertical integration within government, limited use of front-end systems for customer services, and adoption and use of the intranet. There can be self-service elements, but most often in PDF files that can be downloaded, completed, and then returned either as an attachment to e-mail or by mailing the government's completed form. The organizations in this group are not likely to have digital services in focus and rarely have work processed and displayed through the net. Instead, the organization is unclear whether to define the objective of using the internet to increase the user frequency, the services provided, and the quality and speed of services.

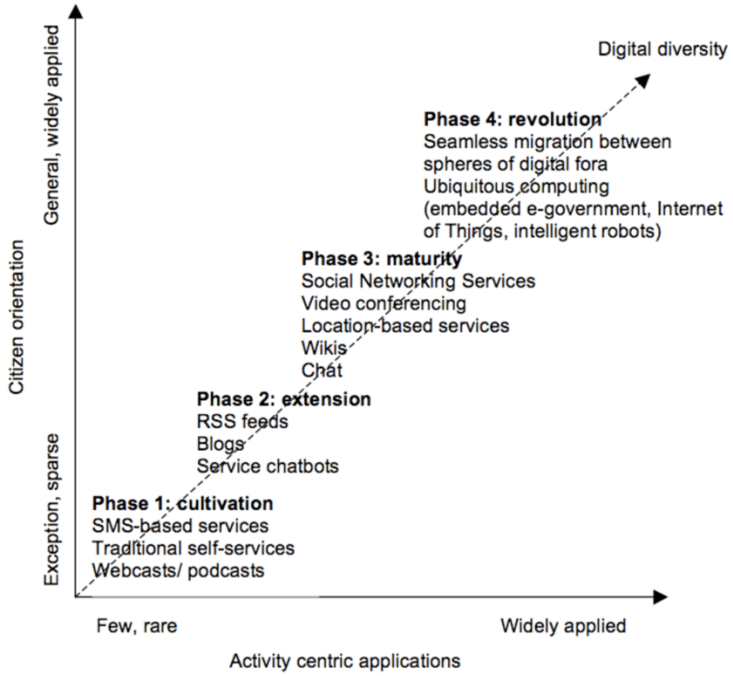


Figure 3. General stages of e-government transformation

From the user point of view, the Internet interface to the public institution in this phase can be experienced as yet another means of enforcing gatekeeping and filtering the users. By gatekeeping, the employees are protecting against stress, and they can control the information flow. The downside is that the public institution in this phase will be experienced as inaccessible, have long case processing time, and no accessibility for accessing the processing of requests.

Many organizations within this group are keen IT users and often prioritize internal data integration and await data integration before proceeding to the users' digital interface. Most governments are now, and worse, it is often considered a strategic goal for most governments.

Having this phase's characteristics as a strategic goal can be counterproductive to the activity and customer focus.

Phase 2 is the extension stage with an extensive intranet and a personalized Web user interface for customer processes. There is a sharp distinction between data and the services provided through them. Ownership and data infrastructure are essential in phase 1, but the Web user interface is targeted towards the end-users rather than other public authorities or the agencies themselves. The ambition of having a user interface for the end-users shines through the actual Web site. While this is a critical difference between phases 1 and 2, this ambition also presents a critical failure risk. It precipitates costly user interfaces, no integration with other systems, expensive maintenance, and fading out of old software and data format.

At this stage, there are still many manual routines. While the user might be likely to find many forms and information, the agency is equally interested in re-directing the users to information at other agencies. Whereas it is a frequent feature at many Websites to provide link icons to other information, we view this feature negatively. The more links to other places, the more negative we would rate the agency. This indicates that the users did not get their requests for information rewarded at this particular agency.

Phase 3 is when the organization matures and abandons the intranet's use, has transparent processes, and offers a personalized Web interface for processing customer requests. The internet and intranet have merged, and the critical concern is to use IT to lower the marginal costs for processing the customer requests for services. Rather than linking to other institutions, the homepage is feeding information from other institutions online. Further, the Web site is organized to solve problems and requests rather than presenting formal organizational structures and general information. Self-service is a critical priority in this phase, and the exceptions where this cannot be completed online are clearly stated with instructions on how to proceed in analog mode.

Phase 4 is the revolutionary phase characterized by data mobility across organizations, application mobility across vendors, and data ownership transferred to customers. In this phase, the employees' actions can be traced through the internet, and there is information available online about progress in, for example, case handling. This is possible through the organizational mobility of data and services. Also, the economics of scale is sought after actively. The internet is not seen exclusively as a means to create increased mobility within the government. Instead, the ambition is to transfer data ownership and the orientation of database infrastructure to the end-users.

Accordingly, a personalized Web interface for customer processes, data mobility across organizations, application mobility across vendors, and data ownership transfer to the customers are still not implemented and constituted in light of the PPR approach's key challenges. The model presented above has limitations in explaining the propensity and technological evolution of personalized services by expanding mobile technology, information, and communication. It does not explain the convergence of the 4th industrial revolution services and technologies that are developing recently.

In comparison with the two models presented above, in this paper, the evolution model for e-government, especially intelligent government, was explained based on the convergence of information and communication technology and services in the fourth industrial environment.

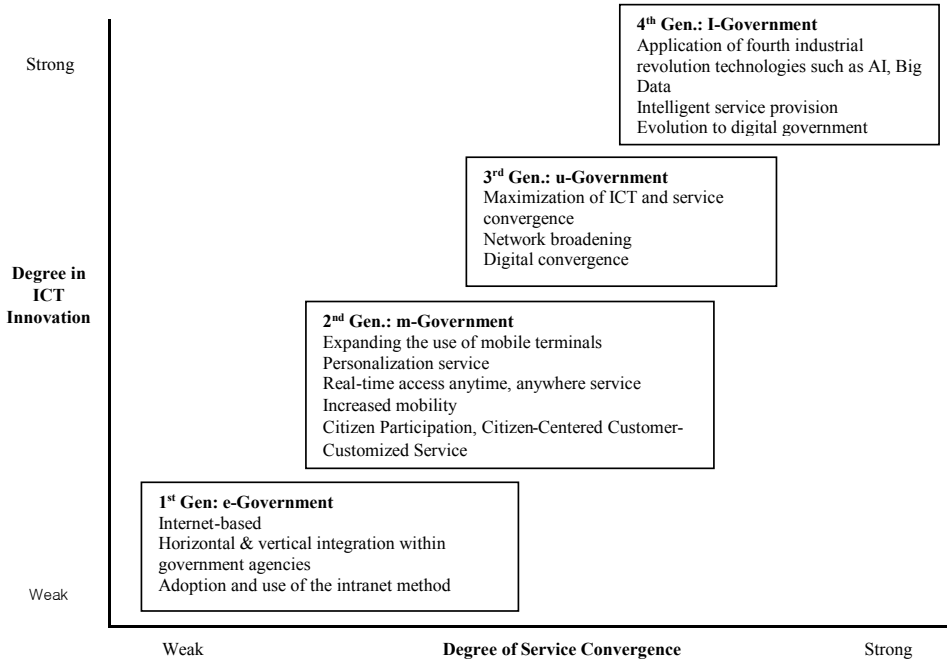


Figure 4. Stages of Development to Intelligent Government

The intelligent government explained the evolution of the intelligent government and the e-government change process, as shown in Figure 4, according to the degree of innovation and service convergence of information and communication technology.

In the first-generation stage, the Internet infrastructure was established. The government was formed based on this, and vertical and horizontal integration was carried out within government agencies based on the internet and intranet. Government service is an innovation stage characterized by data mobility at the whole organization level, application mobility at all suppliers/contractors, and data ownership transfer to customers. At this stage, all activities of employees are tracked and viewed through the internet. Can and provide integrated services of e-government activities within government organizations.

However, the above model has difficulty explaining the concept of convergence evolving in the current ICT field and the change to a ubiquitous environment. In particular, there is a limit to explaining the complexity and degree of integration of evolving information and communication technologies such as mobile and organizations that can perform business anytime, anywhere.

The second generation is the stage where mobile-based e-government services are provided to Internet-based e-government as mobile technology develops. In this is the stage, mobile terminal users are expanded, mobility is guaranteed, and each user's personalization tendency is expanded. Therefore, users can use e-government services anytime, anywhere, using their terminal. The

development of technology is moving from the internet to the mobile, and communication technology continues to evolve.

The third-generation stage has evolved from the mobile government stage to a ubiquitous environment. It is demanded to provide consistent services through various terminals regardless of the location and time. Besides, as the desire for customer-centered integration and customized services grows, customers demand convenient and personalized services. However, with the 4th Industrial Revolution, new changes were needed.

The fourth-generation stage is the intelligent government stage, which is evolving into digital e-government. It represents intelligent e-government that applies the 4th Industrial Revolution technologies such as artificial intelligence and big data analysis to e-government in a ubiquitous environment. The stage in which both 0 Horizontal Integration and 0 revolutionary phases have been completed.

THE STRATEGY OF INTELLIGENCE GOVERNMENT INNOVATIONS

Intelligent Government Strategies

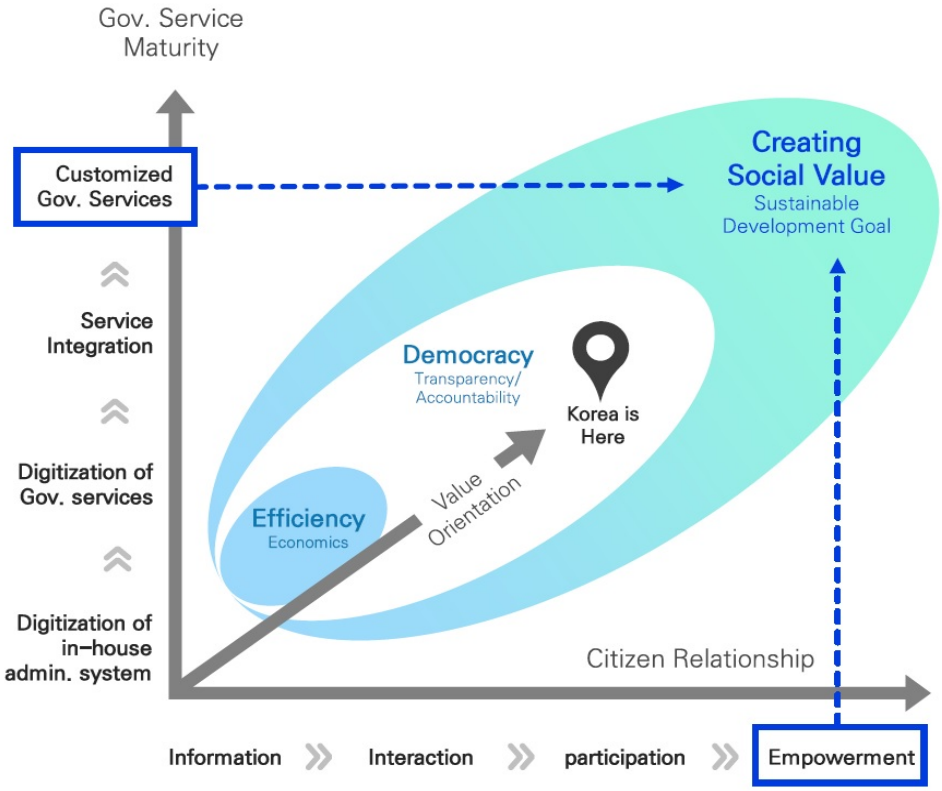


Figure 5. The Value and Goals of Intelligent Government in Korea (NIA, 2019)

The new goal of e-Government is to promote sustainable development by improving efficiency and transparency, solving social issues such as welfare, disaster, life safety, and the environment. Public-private cooperation should be expanded in the administrative and political, and social fields such as e-Democracy, promoting social production, and public services delivery.

Figure 5 shows the current position of the Korean government. It shows the maturity of governmental government services and creating social values with citizens.

Citizen services should shift from segmented customized services centered on specific events to integrated, personalized services that reflect individual citizens' complex attributes and needs. From the use of PC and Internet-centered information technology, the new e-government is used as intelligent information technology such as the Internet of Things (IoT), cloud, data analysis, artificial intelligence (AI), online/offline integration (O2O), and open platforms. It is necessary to drive government innovation and sustainable development based on a new ecosystem in which the government, corporations, civic groups, and individuals collaborate using information technology. As a new e-government initiative in major foreign countries, the United States is promoting the realization of a better 21st-century government for Americans by providing high-quality digital information and services, building a new digital world, and promoting public data openness. It aims to become a government that aims to become a government and promotes information/data-oriented, shared platform, customer-oriented service, security, and privacy reinforcement as core strategies.

The UK aims to become a government that promotes civil service reform together, considering how to digitize the government itself and everything in it. Core strategies include redesigning all services, enhancing digital leadership and capabilities, integrating service access points, improving policy decisions and communication methods, and producing and delivering public-private collaboration services.

Canada aims to be a government that uses digital technology to connect Canadians and access online information and services faster and easier. Core strategies include strengthening connectivity, strengthening information protection, creating economic added value, realizing digital administration, promote content expansion. The goal of the Intelligent Government is a safer and more comfortable life for the people. The four main strategies of intelligent government are as follows.

First, it is to improve the quality of life through services that relate to people. Realize service range expansion and delivery channel differentiation so that government services can reach people anytime, anywhere. It also provides customized intelligent services, e.g., life-cycle service and automated personal assistance.

Second, it is to provide our innovative public services with digital capabilities. Utilizing advanced technology (e.g., cloud-based mobile work system and wearable), a field management system that provides timely solutions anytime, anywhere is built. Furthermore, by using intelligent information technology, it creates a Smart Nation that solves regional problems such as education and welfare.

Third, it is to build a transparent society where justice and trust thrive. It enables public corruption detection and response through real-time big data analysis and encourages all citizens to promote public value through the digital government based on digital platforms. Fourth, the government will create a safer environment with intelligent nationwide infrastructure. It builds a smart digital

network that combines disaster monitoring systems, CCTV, and IoT sensor information. It also strengthens self-learning and self-response cyber defense functions using AI technology.

Intelligent Government Implementation Direction

The Korean e-Government is transforming into an intelligent government with four clear goals. The first is the Wonderful Mind-Caring Government, which maximizes all citizens' digital experience by expanding and converting e-government services, not a specific service user-centered experience, but by expanding and converting service targets, channels, and approaches. Also, target audiences are expanded from specific service users to all citizens (including potential users and digitally underprivileged), utilizing various channels such as online-centered connection to online·offline, and expanding the approach from individual services to all government services. Besides, it provides services by life cycle and intelligent, customized services such as personal assistants that fill users' daily lives. These services provide a user environment through real-time connected channels anytime, anywhere, recognize and judge people, and deliver services in the desired way.

The second is the Innovative Problem-Solving Government. The artificial intelligence-based administrative system continuously learns the entire government-related business processing and decision-making process and proposes improvement plans by itself. Here, the artificial intelligence algorithm will detect irrational and inefficient problems between public officials, ministries, and agencies as a new "work secretary" for public officials and derive alternatives. Also, collecting and analyzing data on users and usage patterns using big data analysis will preemptively discover and propose 'hidden policy demands' without public officials' intervention or adjustment. Besides, by building a cloud-based business system, we will implement a field administration system that can quickly solve and complete problems in the field anytime, anywhere.

The third is the Sustainable Value-Sharing Government. Realize a platform-based digital partnership in which the people and the government jointly produce and share new economic and social values as pro-users. Service users are encouraged to participate in the entire process of service planning, discovery, and promotion, regardless of their role with the provider, and exercise the right to be responsible. Through public infrastructure and data provided by the government, public services are directly completed by the public. Regardless of age, nationality, race, etc., it lays the foundation for digitally coexisting with various society members.

Finally, the Enhanced Safety-Keeping Government. To prepare for complex social risks that are difficult to predict in society, advanced detection using advanced technology or reorganizing the prevention system will strengthen immediate and flexible response capabilities. Transform the living infrastructure built around economic efficiency into a sustainable infrastructure that prioritizes life safety. Besides, we intend to recognize and analyze the adverse functions and risk factors caused by the emergence of new technologies such as artificial intelligence malfunctions and intelligent cyber-attacks and upgrade to an active security system.

CONCLUDING REMARKS

Ultimately, what an intelligent government is aiming for is the digital government. Intelligent government, a part of the digital government, is rapidly changing along with the Fourth Industrial Revolution. Following the industrial and information revolutions, the hyper-connectivity

revolution is now emerging. The future e-government, armed with new ICT, will open a new human-oriented society based on innovation and creativity.

The Korea Government launched the e-government 2020 initiative to solve complex social issues, respond to the rapidly changing ICT environment, and prepare for future e-government. The 2020 initiative will realize the vision "Enjoy Your e-Government" through citizen experience services, intelligent government, and sustainable digital new deals. For the future e-government to be sustainable, the government should challenge social barriers and discover new markets and economic opportunities. Korea's e-government will continue to improve not only its systems, but it will also seek to impact and influence global e-government development.

Acknowledgement

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