

## **Strategic Design of Policy Establishment on the Cloud Service**

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**Abstract:** Cloud is defined as an information processing system that enables flexible utilization of information and communications resources such as information and communications devices, and software integrated and shared through information and communications networks in response to changes in User Speed data. Especially in today's data-intensive environments, enterprises need to efficiently deploy, store, and process Bigdata. This study identifies how cloud service policies are developed from a national and international perspective, identifies trends, and establishes strategies for strategic implementation before introducing private clouds. To this end, I will first segment the research on basic guidelines into domestic and international policies, analyze cloud policies, and analyze how they will be considered when introducing the cloud. This will determine the direction of application of cloud services through cloud legislation and system analysis. I also plan to determine enterprises' cloud goals and establish comprehensive policies for the cloud services.

**Keywords:** Bigdata, Cloud, Cloud Service, Policy Design, Policy Making

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### **1. Introduction**

The cloud is divided into computing technologies and services. In the Act on the Development of Cloud Computing and the Protection of Users, Cloud Computing refers to an information processing system that allows information and communication resources such as integrated and shared information and communication devices, information and communication facilities, and software to be used flexibly through information and communication networks according to changes in demand. Cloud computing technology is information and communication technology on the construction and utilization of cloud computing, which is determined by the Presidential Decree, such as virtualization technology and distributed processing technology. Cloud computing is a kind of service that utilizes cloud computing to provide information and communications resources to others on a commercial basis and are prescribed by the Presidential Decree. Traditionally, enterprises and institutions have managed throughout the network, storage, server, virtualization, operating system, middleware, runtime, data, and application domains. Since then, cloud services have been provided to reduce the scope of the agency by dividing it into IaaS, CaaS, PaaS, FaaS, and SaaS. Korean public institutions are increasingly adopting and utilizing private clouds, and it is expected that all companies will have to push for IT resource management efficiency through the introduction of private clouds to cope with changes and innovations in response to new work environments and IT resource management environments. In this study, it is expected to help enterprises adopt the cloud by studying how to streamline the operation of IT resources through the introduction of a cloud system suitable for their environment.

### **2. Related Works on Cloud Policy**

#### **2.1. Policy Analysis on Global Cloud Service**

In the United States, the federal cloud computing plan was implemented in 2009 with a focus on facilitating changes in public-sector IT infrastructure from a service perspective. The Smart Disclosure policy was implemented in 2010 and recommended that the Government Accountability Office (GAO) actively utilize the cloud through the Smart Disclosure policy. In addition, it implemented Cloud first policy and improved inefficiency of IT procurement such as reduction of existing public sector information assets and consolidation of data centers. In 2011, the federal government implemented a cloud computing strategy to diagnose the federal government's IT environment, diagnose it as inefficient, and present a decision-making framework for cloud transfer. In 2016, the Act on the Modernization of Information and Communication Technology proposed to improve the efficiency of work through the improvement, disposal, and replacement of existing government information and communication systems and specified the introduction of cloud computing. In 2017, the Cloud Only executive order was issued, which made it mandatory for the government to switch to the cloud for all information targets under President Trump's executive order. If a cloud review was forced before, it made it mandatory for all information targets that have recently entered the cloud. By encouraging cloud utilization in the public sector, the U.S. is actively encouraging the inevitable

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adoption of the cloud to reduce costs, increase productivity of its work, and promote effective consumption in the cloud market.

In 2009, the United Kingdom raised the need for public cloud adoption as a policy called Digital Britain. In 2011, the government pushed for the introduction of cloud by public institutions through G-Cloud by setting up a government strategy. The Cloud first policy in 2013 made it mandatory to consider the introduction of cloud services first when procuring public-se IT systems throughout the UK. In 2017, the public cloud first policy made it clear that the cloud first is a private cloud first and announced Cloud Native that I should consider using SaaS more actively. The UK, like the United States, has also made it mandatory for the government to actively consider the cloud.

Other countries such as Europe, Singapore, China, and Japan have also moved to establish projects to spread the cloud across the country, or to declare national policies to introduce cloud systems in a large scale. Around the world, governments are making efforts to adopt the cloud, and it has been confirmed that it will lead to a significant 'first-come-first-served' and mandatory adoption. In Korea, laws and guidelines were established to promote cloud adoption and utilization. As in the previous overseas case, there is a possibility that the cloud may be considered for future first consideration or mandatory introduction.

## 2.2. Policy Analysis on Korean Cloud Service

The paradigm of ICT utilization is shifting from HW-centric to installed SW, and from installed SW to the cloud era where HW/SW is used as a service. It is changing from an on-premises environment to an environment that uses HW/SW as a service, which is a method that installs and operates solutions such as software directly on its own computer server, not on a remote environment such as a cloud. In this regard, the domestic government announced the first basic plan for cloud computing, the so-called K-ICT Cloud Activation Plan, in January 2015. Since establishing the first basic plan for cloud computing, the government has decided to enact the world's first Cloud Development Act in March 2015 to push for a leap into the developed world of cloud. However, understanding that these basic plans were insufficient, leading companies announced the 2nd basic plan for cloud computing development in December 2018 called the Cloud Computing Enforcement (ACT) strategy to feel the 4th industrial revolution. The IT paradigm is shifting from the way in which information systems are built on their own worldwide to the cloud era. In response, the government takes off as a cloud leader and industrial and public. It has established the first and second basic plans for activating the cloud across society. Companies in various fields, including traditional SW, Internet, and telecommunications companies, are competing to take the lead in the cloud market, and countries such as the government and ICT industries in the public sector, such as the advent of the cloud era. In the background of the increasing impact on society as a whole, cloud computing is evolving into an innovative service that promotes the fourth industrial revolution by converging with new technologies such as Bigdata (Park, S. et al., 2015) (Park, S.B. et al., 2015) (Park, S. & Lee, S., 2015) (Lee, J.M. et al., 2015) (Kim, J.K. et al., 2016) (Lee, S.W. & Kim, S.H., 2016) (Lee, S. & Shin, S.Y., 2016) (Nam, M. & S. Lee., 2016) (Kim, S.H. et al., 2017) (Kang, Y.; Kim, S.; Kim, J. and Lee, S. (2017), Artificial Intelligence (AI) (Kim, S. et al., 2018) (Kang J. & Lee, S., 2019) (Kang J. & Lee, S., 2019), and the Internet of Things (IoT) (Huh, S. et al., 2017) (Lee, I. & Lee, K., 2015) (Gubbi, J. et al., 2013), and the overall paradigm of development and distribution of SW industry has changed, raising the need for global competition. As a result, they established the first basic plan for development of cloud computing.

It was suggested that the government needs to establish a specific implementation system by establishing situational diagnosis and policy directions in order to take a leap into the developed world of cloud, and that the public sector needs a preemptive introduction to strengthen the competitiveness of the cloud industry. Therefore, it established a strategy by establishing a strategy for implementing the first basic plan for development of cloud computing and established a task. First, after reviewing threats and opportunities through situational diagnosis, global cloud companies were aggressively entering the domestic market in the IaaS sector, and domestic enterprise cloud competitiveness was weak and cloud-enabled environment was a secret. However, it saw the possibility of domestic companies entering the cloud market and globalizing the cloud market, focusing on SaaS, and saw the possibility of global expansion as a comparative advantage of domestic companies in the IaaS sector led by large companies. In response, the public sector has taken preemptive cloud introduction as a policy direction to strengthen the competitiveness of the cloud industry, and aims to spread the use of the private sector cloud to provide opportunities for SW-specialized companies to switch to cloud companies. From a global perspective, the government has decided to systematically push for the establishment of a growth base for the cloud industry in order to pave the way for cloud service providers to enter the global market. As a result, the vision and promotion strategies were established, and the task was defined to play a role in promoting the spread of the private market and innovating the work of public institutions through the spread of private cloud use. With the aim of boosting private cloud use

in the public sector, the government has set a goal of activating the utilization rate of more than 30% in 2018, fostering cloud companies from 250 in 14 years to 800 in 18 years, and forming the cloud market from 500 billion won in 14 years to 4.6 trillion won. The detailed tasks include preemptive cloud adoption in the public sector, proliferation of cloud use in the private sector, and building an ecosystem for growth in the cloud industry. In the first public sector, the government has set detailed initiatives to promote private cloud use and accelerate G-Cloud transformation. In the second spread of cloud use in the private sector, the government has set up detailed tasks of creating a safe cloud-using environment, improving cloud-friendly institutions, and supporting innovation in small and medium-sized businesses and industries. In establishing an ecosystem for growth of cloud industries, it has set up detailed tasks such as strengthening competitiveness of cloud technologies, promoting overseas advancement of cloud, nurturing cloud professionals, and strengthening competitiveness of cloud data centers. In the first cloud promotion strategy, various systems and promotion systems were prepared for public innovation through promoting private cloud use in the public sector, and various types of leading projects were promoted. To promote private cloud use in the public sector and accelerate government cloud transformation, the government gradually expanded private cloud use by public institutions and promoted large-scale leading projects using private clouds. The government has prepared various systems, procurement, and promotion systems. The first basic plan focused on creating a foundation for fostering industries, but the creation of cases of public and private innovation using the cloud was insufficient. So, how to utilize the cloud through the 2nd basic plan let industry to improve system and establishing implementation strategies such as platform competitiveness and ecosystem reliability. They wanted to realize cloud activation across the public and society. The 2nd basic plan was to derive implications for domestic cloud to increase private cloud use in the public sector. It promoted policies such as improving institutional environment, specializing, expanding specialized markets, and strengthening collaboration among ministries. The existing first basic plan was insufficient to activate due to conservative legal systems such as various regulations. Therefore, it implemented full-scale public sector cloud introduction as a shift to negative regulatory methods. In addition, as the technology gap has widened for more than a year compared to advanced countries, many companies wanted to expand its professional market by strengthening inter-company links and establishing cloud-specific platforms. It was also raised that trust in cloud innovation cases and related ecosystems was insufficient, and they wanted to find best practices for cloud use, find regulatory improvements through implementation, and create a public and industrial innovation. In response, the government has set up a policy to promote the expansion of domestic industries by establishing a legal foundation for securing industrial growth momentum and promoting the expansion of domestic industries with the goal of increasing cloud utilization by more than 10 times by 21 years, increasing cloud utilization by 30 percent.

In the second basic plan, the government drew detailed tasks of expanding public sector use, improving introduction systems, and strengthening security certification and response to improve laws and systems for utilizing cloud in the public sector. To strengthen competitiveness in markets centered on platforms, it has come up with detailed tasks of establishing e-government platforms, establishing specialized platforms, and strengthening its global expansion. To create a reliable ecosystem, the government has come up with tasks to secure technology, train future manpower, and foster security industries. It promoted public sector private cloud adoption through management assessment incentives and budget expansion, and cloud security certification systems to expand the scope and scope of use in the public sector to leverage the cloud. It was pushing for the improvement of the system. In order to expand the use of private clouds in the public sector, the government plans to expand the scope and scope of private cloud use, except for security, sensitivity, and personal information, and revise related laws such as the Cloud Computing Act and the Electronic Government Act. To establish a security certification and response system, ISMS-P provides information protection and privacy management system certification that verifies compliance with management, physical, and technical protection measures for public institutions.

Regarding the introduction of the cloud, the government plans to improve the service contract system so that consumers can use it easily and quickly, and to provide management evaluation incentives by putting innovation and additional points through convergence of new technologies such as cloud in the second basic plan for cloud development plan. It also calls for supporting the first use of the cloud step by step by step by establishing plans for information service projects and implementing budget review projects. In this connection, companies are expected to receive management evaluation incentives through innovation and additional points when they introduce private cloud in the future, as well as supporting the cloud to be used first in the budget review of information service projects.

### **3. Analysis on Legislation and Institution of the Cloud**

#### **3.1. Legislation of the Cloud**

Since there are legal considerations to review when introducing the cloud, the review will be divided into cloud adoption, cloud service utilization, cloud security, and cloud use reviews to review laws, institutions, sub-laws, regulations, and guidelines related to cloud-related basic policies. Reference points for cloud adoption review and implementation are analyzed and used to establish direction for future cloud implementation. The Guidelines for the Use of Private Cloud by Administrative and Public Institutions have been revised to enable public services to be private clouds, but the head of the National Intelligence Service should request a security review at the stage of the project plan. First of all, it is necessary to draw up a group of candidates for Content that can provide private cloud services at construction companies other than drone images currently subject to pilot services. In addition, it is compulsory to establish a PaaS-TA-based operating environment to streamline IT resources inside the construction. In addition, it is needed to prepare an AI-based service environment and conduct a test by utilizing images using GPU servers. In addition, AI service map needs to be prepared by securing contents that can provide AI services by construction business sector to promote pilot-based business.

Security certification for securing cybersecurity in the information and communications network and introducing information protection products should comply with the security certification obligation from the National Intelligence Service when using the private cloud. First of all, to secure cyber safety for the national information and communication network, companies are responsible for securing a constant monitoring system for the operation of the open network. In addition, in order to secure cyber plans through the introduction of information protection products, private cloud service providers must meet the security certification of the NIS to provide services to public institutions. The National Intelligence Service Security Review refers to the procedures for verifying the stability of national and public institutions' information service projects, such as the introduction of informatization products and cloud services, in accordance with the basic guidelines for national information security administration.

The Cloud Security Certification System was implemented in July 2016 to allow public institutions to use private clouds, and when public institutions use private clouds, they will conduct security certification on the cloud in accordance with the National Intelligence Service's administrative rules. It is obliged to comply with the National Intelligence Service's administrative rules, the National Cyber Security Management Regulations, on securing safety for the national information and communication network. It will introduce a system that can be used safely by securing CSAP certificates through KISA's certification review when using cloud services in public institutions. The conditions of the National Intelligence Service's administrative guidelines, Standards and Procedures for Introducing Information Protection Products by State and Public Institutions, will be secured. As a national task to foster new industries through the activation of the use of data, a key resource in the era of the Fourth Industrial Revolution, it is necessary to present new methods and standards for various data utilization of construction. In terms of clarification of the scope of personal information, it governs the application of the law of 'assumed information'. In terms of streamlining personal information processing, it can be processed without the 'agreement' of individuals. In terms of the unification of the information protection system, the Personal Information Protection Committee (under the Prime Minister) is established to maintain policy consistency. It also strengthens post-responsibility for personal information processors. It is expected that data use will be activated by presenting specific criteria for judgment of the scope in the current privacy definition regulations. And, the concept of pseudonym information is introduced so that it can be processed without the consent of the information subject for scientific research, statistics, and preservation of public records for industrial purposes, such as the development of new technologies, products and services. As a result, the scope of data utilization will increase and it is expected that the use of data using new technologies such as Bigdata analysis and AI (Artificial Intelligence) will be activated in the future.

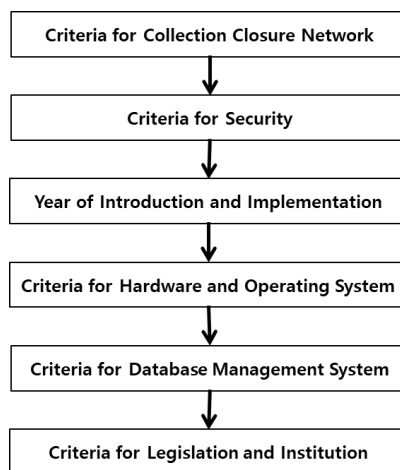
### 3.2. Cloud Service Application Directions through Cloud Legal and Institutional Analysis

In the future, companies need to clarify their direction through this task on how they can provide cloud services in internal and external sectors. Development of technology systems and technical staffing policies that can apply Cloud PaaS-TA based on Open Source to the infrastructure control, management environment, execution environment, development environment, service environment and operating environment within the enterprise. I need to come up with a VDI application plan for Internet PCs managed by the Information Office to reflect the transition trend to Untack society. Measures should be devised to derive targets that can be processed, processed, and serviced externally by generating data from the outside and perform public cloud-based pilot services.

## 4. Design of Policy Establishment on the Cloud Service

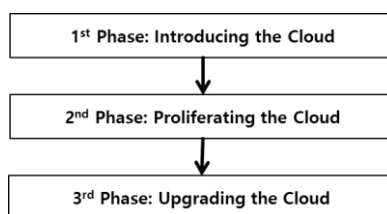
Firstly, I define application criteria for public cloud deployment targets (Figure 1). A corporate closed network cannot be opened outside the network. It should define and filter systems that cannot be disclosed by standards related to the security of companies' information and systems, networks, etc. Recently deployed systems less than five years old are excluded from private cloud considerations due to the simple cost of rebuilding. Systems using

UNIX are difficult to use cloud services and are considered private cloud because they belong to critical business systems. DBMS systems using Enterprise Edition are excluded from private cloud considerations due to licensing and security issues. Systems that contain personal information are subject to private cloud considerations if they cannot be unidentified due to possible legal disputes.



**Figure.1** Procedure to Make Criteria for the Cloud Policy

Secondly, the HW and SW resource survey results of the application system and the evaluation for cloud deployment on an application basis confirm the cloud deployment target. I select the first group of candidates for cloud deployment by filtering applications based on collection networks, personal information, and internal security criteria. Through this, I create a cloud transformation roadmap considering many companies’ policies and direction of implementation as a priority assessment of target systems for public cloud deployment. As a result of evaluating the target for cloud deployment, I present a roadmap for promoting cloud transformation for systems with fixed target for deployment. When introducing private clouds, it is necessary to determine whether commercial solutions currently in use can be maintained and review whether redevelopment issues exist. It is needed to investigate private cloud SaaS services for new systems, and prioritize use through conformity verification and judgment. Government standard development platform PaaS-TA is established to manage IaaS based on PaaS-TA and to secure cloud service competitiveness and technical personnel.



**Figure.2** Roadmap for the Cloud Policy

Thirdly a roadmap (Figure 2) for enterprises' cloud transformation is created. The road map consists of three parts: introduction, proliferation, and upgrade. In the first stage of introduction, it is going to introduce a new system cloud service first. The introduction of private cloud in external portal systems can be promoted. If it is located in an external network and does not have a history of redevelopment, a system that is easy to transition to the cloud can be promoted first. In order to build a development environment for this, it may be considered to build Pass-TA. In the second stage of proliferation, it is possible to push for the introduction of cloud for major business systems located in many companies’ internal network. It can be converted to a government-certified cloud for commercial solutions, or into a system that requires modification development due to the client/server architecture. In the last three phases of upgrade, the transition to an internal system for many companies’ key decisions can be pursued. The

transfer may be carried out considering data storage and recovery schemes that use high-capacity storage space. At this time, an overall review of the management information system should be conducted.

## 5. Conclusions

This study derived implications for domestic and foreign cloud service policies through analysis of domestic and foreign cloud policies and laws and institutions, and analysis of corporate system status. In addition to the U.S. and the U.K., it is mandatory to introduce private clouds of public institutions in major countries around the world to change the target of information service. The South Korean government and public institutions are planning to expand their use of Cloud from introducing Cloud. The Public Cloud First policy implies that cloud first is a private cloud and that SaaS should be actively considered. In Korea, private clouds are required to be actively used to increase work efficiency and reduce public sector IT budgets by sharing information between government departments through the cloud. Asking cloud users as they are responsible for management and supervision or damage compensation can reduce the use of cloud services themselves. It is necessary to specify the scope and criteria for stopping the service because delayed payment of subscription fees can immediately be disrupted, which can have a fatal impact on business continuity. User data cannot be effectively protected in the event of sudden suspension, abolition, or service interruption of the operator. It is difficult to meet the security environment of cloud operators that meet the certification criteria for information protection by domestic public institutions. Other laws and regulations, public notices, public announcements, rules, and manuals are not related to the cloud. It is necessary to analyze private cloud technology to enhance the competitiveness of IT services by public institutions to review the establishment of an open source-based private cloud environment for companies. Companies have dedicated data centers and DWDM-only networks, so the reason for reviewing the public cloud is weak, and the hybrid method of combining it with private clouds is a realistic solution. As there are many filtering criteria for public cloud application, there are very few applications, so the effect of private cloud application can be minimal.

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