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〈Abstract〉

A 'non-face-to-face Service' is emphasized in the business activities and personal lives. This study reviewed the characteristics of each stage of development of civil certificates issuance and distribution of the Republic of Korea in the era of non-face-to-face service and derived implications for the acceptance of electronic documents.

In December 2019, the Korean Government introduced a new paradigm for issuing certificates in electronic forms. In order to review each development stages and characteristics of issuance of government certificates in the Republic of Korea, the researchers reviewed academic researches, government disclosure materials related to Electronic Government and Digital Government. In particular, the study compared and analyzed the characteristics and differences of three methods of issuing non-face-to-face certificates(Kiosk Machine, Online Civil Certification Service and Electronic Certificates Issuance Application) and brought out prerequisites for the implementation of the Online Electronic Certificate Acceptance System.

The Korean Government has continuously improved the administration services of issuing certificates. To avoid visiting several administrative offices, 'community service' centers were designated to issue the certificates, and the certificates could be issued 24 hours a day at kiosk machines or online government portal. Since the certificates were issued in paper form, most of the applications for various civil services and financial services that occurred after the certificate was issued, were mostly made in person or by post. Electronic Certificates are expected to drive non-face-to-face administrative services in the 'Digital Era' and 'With Corona Era'. Unlike paper documents, people can't receive Electronic Certificates directly, so the certificate receiving entity needs technical preparation.

Organizations that receive various applications for such as civil service administration, finance, entrance examination, and recruitment should prepare for the forthcoming change of receiving method. A receiving organization should be able to receive government-issued Electronic Certificates as well as non-government-issued certificates, and also paper certificates in a transitional period. With electronic documents available 24 hours a day, the receiving entity needs to process applications received after working hours and may need to apply artificial intelligence in the field.

Keywords: The Republic of Korea, Government civil certification service, Digital government innovation, Civil service certification innovation, Electronic certificate

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Ⅰ. Introduction

Since the 1990s, South Korea has introduced various e-government services that utilized the world's best ICT infrastructure. Electronic Government services have increased efficiency and transparency in public administration, made it possible for the people to enjoy convenient and high-quality services, and improved national competitiveness[1]. In particular, the Online Civil Certification Service("the OCCS") of the Ministry of the Interior and Safety(MOIS), introduced in 2002, was very innovative because various certificates could be printed 24 hours a day without visiting government offices. In 2014, the National Tax Service established the Year-end Settlement Simplification Service(www.yesone.go.kr) to issue a PDF file certificate from the Year-end Settlement filing in 2014. At the time, the year-end settlement documents were only issued as paper documents, and there was an inconvenience of re-entering the details and submitting them with the paper application, but when the PDF file was registered in the enterprise's ERP system, the year-end settlement data contained in the PDF file was automatically captured. In 2017, the Ministry of Land, Infrastructure, Transport and Tourism implemented the Integrated Real Estate Trade Support System(IRTS) service to be available nationwide. The parties may enter into contracts by electronic signature in electronic documents in a non-face-to-face environment. Buyers can apply for loans by submitting the electronic contract online to financial institutions. Financial firms can offer preferential interest rates because of non-face-to-face cost savings and improved credibility[2]. In October 2019, the Korean Government announced a plan to Digital Government Iinnovation Implementation that will change people's lives, and the plan was including paperless financial services using electronic certificates have been introduced.

Finally, in December 2019, the Ministry of the Interior and Safety(MOIS) implemented the "Electronic Certificate Distribution and Issuing" service that handles the application, issuance, and submission of certificates on smartphones. In this study, an Electronic Certificate is an official document issued to a citizen electronically by the government, such as Resident Register, Building Register, Vehicle Register and Certificate of Entry and Exit. The researchers reviewed the characteristics of an Electronic Certificate that will facilitate non-face-to-face service convergence in various industries in the post-corona era.

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1) Ministry of the Interior and Safety(2017), *Koreas E-government best practices.*
2) Ministry of land, Infrastructure and Transport(2017), *All real estate transactions receive preferential interest rates by electronic contract.*

II. Materials and Methods

The OCCS began with the Electronic Government project. The Clinton administration, for the first time, introduced the concept of an Electronic Government in 1993. The concept of electronic banking in the financial sector is applied to the administrative areas, which can be said to be an innovation of the organization and functions of government by utilizing information technology[3]. According to the ISO 15489 record management standard, documents or records shall have authenticity, reliability, integrity and useability. Paper documents can be recognized for their originality by ensuring that they are as they were originally made. In the case of copies, they prove to be identical to the original by means of a 'Certified True Copy' seal. However, electronic documents are hard to establish the original concept. This is because digital data is the same as the original, even if it is copied multiple times[4].

In response to this challenge, electronic signature technology was developed and as a result, because the application of electronic signature technology to electronic documents, integrity can be maintained and verified. Therefore, because electronic documents are easy to change, the point that there is uncertainty, unlike paper documents, can no longer be a ground for denying the evidence function of electronic documents[5]. An Electronic Certificate is created by a PKI based digital signature(TST or PKCS#7) in PDF format document. The integrity of Electronic Certificates can be verified through a PDF viewer that can verify digital signatures. "Document integrity verification confirms whether the signed content changed after it was signed"[6]. Satya Nadella, CEO of Microsoft, in his quarterly report made in April 2020, expressed that due to the coronavirus outbreak, there had been two years' worth of digital transformation in two months and emphasized that now the world is moving towards remote everything[7]. The South Korean Government announced a comprehensive plan

3) Soh, Y. J.(2003), Overcoming the dilemma in the structure of E-Government building project: in the case of E-Government special committee, *Information Policy,* 2003(10), 30-49.
4) Song, B. H.(2004), A study one the direction of electronic document interchange for Korean government. *Journal of the Korean society for information management*, 21(3), 185-202.
5) Kim, H. K.(2012). Criminal interpretation of electronic document. *Police Journal*, 12(3), 74-104.
6) Adobe(2020), *Validating digital signatures,* Website.
7) Tiley, A.(2020). *Microsoft earnings jump, aided by cloud-computing demand during pandemic*, The Wall Street Journal.

for the Korean version of the New Deal in July 2020. The government predicted that the shift to the digital economy would accelerate as social structural changes under Corona 19 surged in non-face-to-face demand. The Korean version of the New Deal consists of three strategies: 'Digital New Deal', 'Green New Deal' and 'Safety Net Enhancement'. The third sub-program of the Digital New Deal includes "cultivation of the non-face-to-face industry" plan, which is expected to spend 1.1 trillion won over the next three years to create 134,000 jobs[8]. In preparation for digital government and non-face-to-face services that will be emphasized in the corona era, this study intensively reviewed the context of the three procedures for application, issuance and submission of Electronic Certificates.

III. Results and Discussion

3.1 Traditional Paper Certificates and Unmanned Issuing Equipment(Kiosk)

Paper certificates are the oldest certification method in use to date. As of December 2019, the method of visiting and issuing certificates to the community service center still accounts for the largest proportion in the Republic of Korea. Since all administrative agencies of Korea are connected by a computer network, citizens can get the necessary certificates immediately if they visit a nearby administrative agency even if they are not in the area of residence. Depending on the type of certificates, some certificates must be submitted by filling out an application, and others could be requested orally. Applicants must present either Identification Card, Driver's License or Passport for personal identification. Meanwhile, in order to improve public accessibility, kiosk machine is operated 24 hours a day within administrative agencies and places with large floating populations, allowing certificates to be issued in a non-face-to-face manner. When issuing certificates from a kiosk machine, a kiosk machine checks the identity of applicants with an identification card and fingerprint authentication and issues requested certificates. According to the MOIS website, there are 4,430 kiosks operating nationwide as of July 2020.

8) Korea Government(2020), *Korea new deal master plan*.

3.2 Online Civil Certification Service(www.gov.kr)

The OCCS has been in effect since 2002. The method is for the civil applicant to access the Government integrated online civil services website(named "Government 24", "www.gov.kr") and apply for issuance, and print it out to the applicant's printer. It is necessary to have an Accredited PKI Certificate, which is equivalent to an ID card to use the OCCS service. An applicant can print out a Certificate without visiting the administrative office. The OCCS installs a security program on the applicant's computer to prevent file storage by unauthorized methods such as screen capture and controls the computer to print only on physical printers. In an early stage, there was a technology dependency issue because the security program was developed using Active-X Control and users had to use only Microsoft explorer for the certification service. But recently, the security program supports multi-browser such as Chrome or Firefox. The bottom of the printed certificate, 'Issued over the Internet' is labelled together with a given unique number. A copy protection code, or a Watermark, indicates 'A Copy' once copied, and a two-dimensional barcode that helps verification of forgery and alteration of the certificate.

The OCCS allows an applicant to designate a specific person as a designated third party, and a designated person can issue a certificate on behalf of the applicant. Besides, many paper certificates are issued as a paid service, while OCCS is mostly provided for free of charge. However, the service is only available with a Microsoft Windows OS PC, and many security control software is mandated to be installed, and some complain that there is a limitation of functions on smart devices. According to the National Statistical Office (December 2019), 1,036 types of certificates can be issued(or printed) over the internet[9]. Figure 1 illustrates the process of online issuance and offline submission.

9) Statistics Korea(2019), Government 24 Service(www.gov.kr) Statistics, e-Nara Index.

<Figure 1> Online Civil Certification Service (OCCS) Procedure

While the OCCS was operated mainly for individuals, companies had to issue certificates from websites operated by each certification organization. Since July 2020, the Korean Government has been operating a one-stop "Small and Medium Venture 24 (www.smes.go.kr)" service that combines information and services provided by various websites for small and medium-sized enterprises. This one-stop service covers the issuance of eight certificates supporting startups, R&D and smart factories[10]. "Small and Medium Venture 24(www.smes.go.kr)" is currently only providing a paper certificate output method. However, the MOIS electronic certificate issuance service is currently undergoing second phase development project which is including the Electronic Document Wallet and a certification API for enterprise, and it is expected that certificates for cooperate will also be processed in an electronic manner.

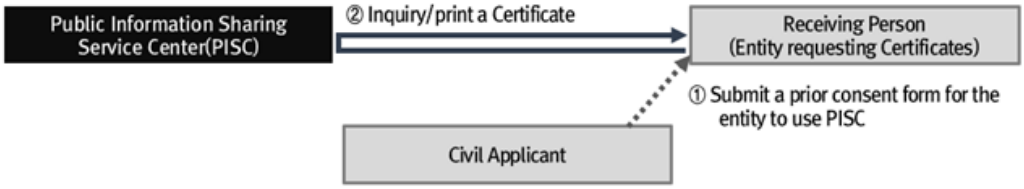
3.3 Public Information Sharing Service (PISC)

The The PISC has been in effect since 2006, and it was designed to improve the inefficiencies in which a citizen submits certificates issued by an administrative office to other administrative offices, and eliminates the risk of forgery of online issued certificates. Instead of submitting a certificate to an administrative office, the reception of the administrative office receives the applicant's certificate directly from PISC. For this, the administrative office must acquire a "PISC prior consent" that allows the received entity to inquire information to the PISC. The certificate issued through a PISC bears a watermark "For Reading Only" which distinguishes it from other certificates issued directly to applicants. According to the PISC white paper, 37.1% of total documents issued by public institutions in 2005 were submitted to financial institutions, 20.8% of private companies, 19.8% of administrative offices and 10.0% of public institutions[11]. In response, the Government of

10) Ministry of SMEs and Startups(2020), *SME24 Introduction*.
11) Ministry of the Interior and Safety(2007), *White paper on Government Information Sharing*.

Korea expanded the PISC for financial institutions as well as Government and administrative offices from April 2007. In the case of simple financial services, such as small credit loans (e.g. MFI), it is very convenient because a borrower can process the loan only with an Identification Card and without submitting a separate certificate. Figure 2 illustrates how certificates are inquired based on PISC prior consent without issuing them directly.

<Figure 2> Public Information Sharing Service Center (PISC) Procedure



3.4 Electronic Certificate Issuance Application Service

The Electronic Certificate Issuance Application service was implemented in December 2019. Prior to its implementation in October 2019, the Korean Government's Digital Government Innovation Promotion Plan presented a case of submission an Electronic Certificates for financial business as a future model, and it has caught the attention of media. As of July 2020, 13 kinds of certificates have been issued as electronic documents. According to the BPR/ISP consulting results, Electronic Certificates are expected to have a quantitative effect of 5,412.3 billion won(5,142.2 billion won for civil applicants and 288.6 billion won for issuers). The electronic certificate issuance service is planned for phase 3, and the second phase of the project is currently underway in 2020. In 2020, 100 types of electronic certificates will be available in conjunction with a number of certificate issuing agencies, and a package application function will be developed that allows multiple Electronic Certificates to be submitted at once. In 2021, the third phase project will add 200 extra types of Electronic Certificates, expanding to a total of 300. Currently, an Electronic Document Wallet can be used only in Government 24 application, but the MOIS is expanding the usecase by cooperating with private and public entities such as NHN Payco and Korea Rural Community Corporation[12].

Due to the nature of the media, Electronic Certificates cannot be passed directly to a

12) Ministry of the Interior and Safety(2020), *Non-face-to-face service for credit loans and charges can also be used with electronic certificates.*

person. Applications for Electronic Certificates use the Government 24 mobile application. When the applicant creates an Electronic Document Wallet in the Government 24 application, the Electronic Document Wallet address is generated and an Electronic Certificate is issued at the address. If a citizen passes an Electronic Certificate to a third party, it will be sent to the other party's Electronic Document Wallet address. That is, the Electronic Document Wallet address is an Electronic Certificate transmission and reception identifier. The Electronic Document Wallet address is a combination of a 39-digit string of upper and lower case alphabet and number. In the case of a public institution or financial company, it can be selected by looking up by the name of the institution. If a citizen is required to submit an Electronic Certificate while offline, such as visiting a financial company, a citizen may submit an Electronic Certificate by recognizing the QR code presented by the other party. It is also possible to pass Electronic Certificates using Kakaotalk(the most famous messenger in korea) messenger, which is the most popular messenger in South Korea. The history of issuance and submission of certificates can be found on the Government 24 application and an Electronic Certificate website.

There are two ways for a receiving person to receive an Electronic Certificate after the applicant submits an Electronic Certificate from a Electronic Document Wallet to the receiving person. The first is a method of accessing the PISC website and searching and viewing the applicant name and Personal Information Number (PIN) to confirm (or reject) receipt and download the Certificate file. This method is limited to organizations that are eligible for PISC use, such as administrative offices and financial companies. The receiving organization IT system receives an Electronic Certificate, registers it with the internal legacy system, and then the receiving person uses the Electronic Certificate. In this case, the receiving person should establish an Electronic Certificate receiving system by installing the "Receiving API" provided by the Government, and it is necessary to develop technology for the subsequent business processing, such as linking with the Electronic Document Management System(EDMS, ECM, etc.) to perform work seamlessly. The issued Electronic Certificate is a PDF file with a digital signature. Electronic Certificate authenticity verification is applied two techniques of comparing the blockchain hash value and a digital signature integrity check using an G-TSA(Government Time-Stamping Authority). If a user can access internet network, a user can download the plug-in for Acrobat Reader PDF program provided by the G-TSA website and install it on your PC to verify its integrity using the Acrobat Reader[13]. Figure 3 describes the issue of online certification and the process of online

13) Choi, D. J. and Kim, S. B.(2019), Non-Face Mortgage Loan Using the Electronic Document Wallet and the Electronic Certificate, *The Credit Card Review*, 13(4), 71-104.

submitting.

<Figure 3> Electronic Certificate Issuance Application (ECIA) Procedure

Electronic certificates were publicly known and spread because of the influence of Corona-19 pandemic about three months after implementation. In March 2020, when the demand for KF(Korea Filter) certified masks skyrocketed due to Corona-19 crisis, the South Korean government imposed Five-masks per person rule from March 9 to May 31, 2020, and limited the quantity of masks that can be purchased per person.

The person who bought the masks on behalf of the family had to provide proof of the family relationship, at the site of the mask sale and the Electronic Certificate which can be presented immediately became popular[14]. Table 1 shows the number of Certificates issued by non-face-to-face service, and Table 2 describes the number of Electronic Certificates issued. In March 2020, the issuance of Electronic Certificates increased by 360.4% compared to the previous month.

14) Ministry of the Interior and Safety(2020). *When purchasing a public mask, use your electronic certificate!.*

<Table 1> Number of non-face-to-face certificates issued

Type	2019.2.~3	2020.2~3	Increment	Increment Rate
Sum	26,162,279	33,361,641	7,469,362	28.6%
Online Civil Certification Service(www.gov.kr)	20,911,351	27,147,770	6,235,419	29.8%
Kiosk Machine	5,250,928	6,368,616	1,117,688	21.3%
Electronic Certification Issuance Application Service	-	116,255	116,255 (20,745 + 95,510)	Net Incremental

<Table 2> Number of Electronic Certificates issued

Type	2019.2	2020.1	2020.2	2020.3
Number of issues (total of 13 types)	9,399	20,287	20,745	95,510
Percentage of increase or decrease in the previous month	-	116.8	2.3	360.4

Table 3 outlined the five types of certification method and its characteristics, including the issuance of paper certificate service(visiting government offices or kiosks), Electronic Government service(portal issuance of Certificates and PISC), and Digital Government service (Electronic Certificate service). There are three types of non-face-to-face certification method: kiosks, portal issuance, and Electronic Certification, and only Electronic Certification makes electronic submissions available. The researchers categorized traditional paper certificates as Certificate 1.0, the method of issuance(PISC) directly by the receiving person as Certificate 2.0, and electronic submission in electronic media as Certificate 3.0.

<Table 3> Comparison of Civil Affair Certificates

Type	Paper Civil Certification		Electronic Government		Digital Government
	Government offices	Kiosk Machine	OCCS	PISC	ECIA
Certificate Version*	Ver 1.0	Ver 1.0	Ver 1.0 (2002~)	Ver 2.0 (2006~)	Ver 3.0 (2019)
Application For Issuance	Visit (On Site)	Visit (On Site)	Online Website	N/A	Smartphone Application
ICT Hardware	N/A	N/A	Computer, Printer	N/A	Smart phone, other Smart Equipment
Preparations	Identity Card	Identity Card	Accredited PKI Certificate	Identity Card	Accredited Certificate
Applicant Identification method	Identity Card and Face To Face	Identity Card and Fingerprint Authentication	Accredited PKI Certificate	Face To Face	Non-Face-To -Face
Certificate Type	Paper Output (Staff Print)	Paper Output (Kiosk Printing)	Paper Output (Self Printing)	Paper Output (Receiving person Print)	Electronic Document (PDF)
Fee	Charged	Charged	Free	Free	Free to date
Issuing location	Government offices	Kiosk machine location	Applicant location	Receiving Person location	Electronic Document Wallet Address
Additional submission documents	None	None	None	PISC pre-Agreement	None
Certificate Submission	Paper certification submission (On Site)	Paper certification submission (On Site)	Paper certification submission (On Site)**	Indirect submission (Receiving Person)	Electronic certification submission (Online)***
Certificate Integrity Verification	Eye Check	Eye Check	2D Barcode Scan & Verification	N/A	Digital signature Verification**** And Blockchain

* The certificate version was distinguished by the researcher.

** If it is issued by a third party, it can be checked directly by the receiving organization, so the submission process can be omitted.

*** 3 ways: request to submit to the receiving entity's electronic document wallet, send one-time URL & password creation message, and send QR code

**** A system built on 10 of the 11 challenges of e-Government. Structure that inserts PKI-based timestamp values into PDF documents

IV. Conclusion

The Republic of Korea is a world-recognized model quarantine country against Covid-19 crisis and Korean government managed to control the spread of Corona without restrictions on people's movement. Untact economic activities are encourgaed worldwide until vaccines and remedies are prepared. The introduction of Electronic Certificates necessary for various economic activities is expected to further accelerate various untact or non-face-to-face services. The researchers' conclusions on the review of the South Korean government certificate issuance service are as follows:

First, the Government of the Republic of Korea operates a number of different measures for issuing certificates with characteristics, which are clearly different from each other. The electronic certificate, defined as Certificate 3.0, is accompanied by the so-called "Bank/People/Government 3.0 Philosophy" in that it provides a direct one-on-one service to the citizen in the Hyper-Connected era.

Second, since Electronic Certificates are processed as information systems, the reception organization must expand the information system leading to the Electronic Certificate reception, acceptance (rejection), processing, and preservation stage. If issuing organization operates a 24-hour non-face-to-face service, the organization will need to prepare for the processing of the rule-based or AI method to determine whether the immediate (or next-day) processing for the application received after the working hours is essential. In particular, given that 37.1% of government-issued certificates are submitted to financial firms, a strong push is needed in the financial industry.

Third, with the introduction of a new form of certification, the reception organization needs technical support to prepare for the transition and to close the digital divide among the reception organization. Certificates that are not issued electronically must also be available to the receiving authority. This is because even if 300 types of electronic certificates are provided by 2021, more than 700 types of certificates are still issued on paper. In addition, the seperated process of verifying the authenticity and integrity of the received paper certificates and Electronic Certificates may cause confusion in the administration works. Therefore, the introduction of Certificate Consolidation System for electronic certificate applicants and reception organization is necessary. Finally, when developing the Electronic Certification system, the Korean Government had to start from the scatch. Technical standards

and guidelines for Electronic Certificate shall be discussed in and prepared by international organizations and standard bodies such as UN or ISO. And the harmonized and standardized procedures and technical components will make the cross-border exchange of Electronic Certificates available in the future.

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대한민국 정부 온라인 증명서 발급 혁신 과정 연구

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〈초록〉

기업의 영업활동과 개인 생활에서 '비대면 서비스'가 강조되고 있다. 이 연구는 비대면 서비스 시대, 대한민국 정부 민원증명서 발급 및 유통 발전 단계 별 특징을 검토하고 접수조직을 위한 시사점을 도출하였다.

대한민국 정부는 2019년 12월 행정기관이 발급하는 증명서를 전자문서로 발급하는 새로운 패러다임을 도입했다. 연구자는 대한민국 정부 증명서 발전단계 및 특징을 검토하기 위해 선행 학술연구, 전자정부 및 디지털정부 관련 정부 공개자료 등을 검토하였다. 특히, 이 연구는 비대면 방식의 증명서 발급 방법 3가지(키오스크, 온라인 민원발급, 전자증명서)에 대한 특징과 차이점을 비교 분석하고 온라인 접수시스템을 구현하는데 필요한 전제조건들을 도출했다.

대한민국 정부는 증명서 발급 행정을 지속적으로 개선해 왔다. 개별 행정기관을 방문하는 대신 주민센터에서 다양한 증명서를 발급할 수 있게 했고, 키오스크 장비나 인터넷 웹사이트에서 24시간 발급받을 수 있도록 했다. 그러나 해당 증명서는 대부분 종이였다. 증명서가 종이로 발급됨에 따라, 증명서를 첨부하여 신청하는 각종 민원행정과 금융 서비스 신청도 방문 및 우편 등 으로 진행되었다. 전자증명서는 발급신청, 발급, 제출/접수 모든 절차를 온라인으로 처리할 수 있다. 전자증명서의 활용은 '디지털 시대', '위드 코로나 시대' 비대면 서비스를 가속화 할 것으로 기대한다. 전자증명서는 파일 형태로 발급되므로 종이문서와 달리 사람이 직접수신 할 수 없도 유관으로 진위확인 할 수 없으므로 기술적 준비가 필요하다.

각종 민원신청, 금융, 입시, 채용 등 다양한 신청 접수를 받는 조직은 향후 증명서 접수 방식의 변화에 대비해야 한다. 향후 접수방식은 오프라인 신청과 접수와 온라인 신청이 병행될 수 있다. 이때 정부발급 전자증명서 뿐 아니라 민간 증명서도 수신 받을 수 있어야 하고, 전자적으로 발급되지 않은 증명서도 수신 받을 수 있어야 한다. 온라인 접수신청이 24시간 운영됨에 따라, 근무시간 이후 수신된 신청을 자동으로 처리할 수 있는 인공지능 개념 적용이 필요할 수 있다.

핵심 단어: 대한민국, 정부 민원증명서, 디지털 정부 혁신, 민원증명서 혁신, 전자증명서

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