Press Release

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Waseda University Institute of D-Government

International Academy of CIO

16th Waseda University-IAC World

Digital Government Ranking 2021 Survey

Introduction

The Institute of Digital Government at Waseda University in Japan, in cooperation with the International Academy of CIO (IAC) has released the 16th Waseda IAC World Digital Government Rankings Survey 2021, which marks digital transformation in 64 countries/economies. The Institute was established in 2002, and the ranking survey model was created in 2005 by Prof. Dr. Toshio Obi, a Founder of the Institute and President of IAC at the time of the First Ranking Survey. Dr. Obi was awarded a spot on "The World's Most Influential 100 People in Digital Government in 2018" by "Apolitical",a UK based Think tank. In 2021, both the Institute and the ranking survey are mainly managed by Prof. Dr. Naoko Iwasaki of Waseda University.

We hope this survey will be able to contribute excellent values globally to all parties concerned. We have now unfortunately suffered from the serious COVID-19 pandemic all over the world for a couple of years, and we are sure that Digital Government can offer effective solutions regarding the pandemic issues. It is well noted that this edition is extremely significant in the process of promoting SDGs. In addition , the 16th memorial anniversary ranking report is well associated with both digital innovation and

transformation.

We appreciate Research Fellows headed by Dr.Hien at APEC Digital Government Research Center for their great contribution as well as Researchers of the Institute of Digital Government at Waseda University and International experts in 11 worldwide universities of IAC listed in the contributors corner.

Drs Toshio Obi and Naoko Iwasaki
Waseda University

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Preface

The Institute of D-government, Waseda University in cooperation with IAC(International Academy of CIO) has published the "16th Waseda-University-IAC World Digital Government Rankings 2021". Digital government is required to act as a catalyst for digital administrative and financial reforms and contribute to significant cost reductions and administrative DX. Full-scale promotion and development are indispensable as a starting point for economic growth / innovation strategies and strengthening international competitiveness. This survey analysis evaluates the progress of digital governments in 64 advanced ICT countries from multiple perspectives using 10 major indicators and 35 sub-indicators, which models were created by Dr. Obi. It is trusted by related organizations around the world including APEC and has a high degree of contribution to the digital society.

The "World Digital Government Ranking 2021" explains the comprehensive achievements and historical transitions of digital governments in 64 ICT-developed countries/economies around the world. This ranking has attracted attention from all over the world as the world's two largest evaluations, along with the United Nations ranking. While this ranking is announced annually, the United Nations ranking publishes on three indicators every other year.

The top ten countries/economies of this 16th survey were Denmark in first place, Singapore in second place, and the United Kingdom in third place. The United States was fourth, Canada was fifth, Estonia was sixth, New Zealand was seventh, South Korea was eighth, Japan was ninth, and Taiwan was tenth.

In addition to explaining the rankings and describing each item and region, overarching themes and trends, such as the progress of the world's digital government over the past 16 years, changes in overall rankings, rankings by sector index, rankings by region, and new trends of interests are all summarized in this report.

The structural weaknesses of major countries/economies includes the vertically divided administration of government offices exposed in response to Covid-19, the separation of e-government (central) and e-government (local), the financial and digital divides among local governments, and the shortage of ICT human resources.

Looking ahead to the future with a declining birthrate, an aging society, and, public-private integration and open innovation through digital utilization will greatly contribute not only to cost reduction and efficiency improvement of administrative and financial reforms, but also to improve the convenience of people's lives.

The top priority of the digital government in the future will be to shift to a new lifestyle and promote administrative DX through vigorous and rapid digitization. It is also important to protect the stability, security and safety of people's lives by providing economic revitalization and high-quality administrative services.

It is important to aim for overall optimization by digitizing central and local areas, not just individual optimization. In that sense, the role of the digital chief, CIO, who has a strong decision-making ability, will also attract attention. Furthermore, the integration power of the world's three major advanced technologies "5G, AI, 8K" will be the basis of global innovation and digital growth strategy for overcoming the COVID-19 with recession.

This survey discusses the causes of delays, strengths and weaknesses, the significance of the digital government and the future image of digitalization through international comparison and summarizes the issues and recommendations. This report can be used as a "global textbook" for creating new digital strategy amid reducing growing uncertainty due to the COVID-19 disaster.

This evaluation model was developed in 2005 by Prof. Dr. Toshio Obi (since 2018, he is a Professor Emeritus, Waseda University), the first Director of the Institute. Dr. Obi received the Minister of Internal Affairs and Communications distinguished Award in 2015 and also 2018.

The Institute also serves as the APEC Digital Government Research Center, which was created by APEC in 2005. The World Digital Government Ranking Evaluation, which celebrates its 16th anniversary this year, is at the core of international collaboration in Digital government research as a means of providing policy support materials to industry-government-academia leaders in each Country/economy.

The IAC (International Academy of CIO), a global NPO organization, represents affiliated universities and academic organization in order to obtain the latest and most accurate information and analyze and evaluate data. We have formed a joint international team by international distinguished experts from the following academic Institutions for many years.

A joint research and advisory group has been founded from the distinguished experts of collaborating universities among IAC members. These are National University of Singapore (Singapore), Peking University (China), George Mason University (USA), Bocconi University (Italy), Turku University (Finland), Thammasat University (Thailand), The Russian Presidential Academy of National Economy and Public Administration (Russia), LaSalle University (Philippines), Bandung Institute of Technology (Indonesia), Taiwan e-Governance Research Center (Taiwan), and Waseda University which is a coordinating body.

In the research process, a team of expert's exchange views with international organizations such as APEC. With Professor Iwasaki as the leader of the Institute of D-government Waseda University, we will analyze the progress of each area more concretely toward the global development and cooperation of the digital society and aim to solve various issues relating to SDGs,　Ageing society and global warning.

A. World Digital Government Ranking 2021

Overall Ranking

Table 1. 16th World Digital Government Comprehensive Ranking 2021

no	Country/economy	Score
1	Denmark	94.2748
2	Singapore	94.0520
3	UK	93.9841
4	USA	93.7210
5	Canada	90.9754
6	Estonia	90.1617
7	New Zealand	90.0918
8	South Korea	88.1366
9	Japan	87.6184
10	Taiwan	87.3255
11	Australia	87.2496
12	Sweden	86.8587
13	Finland	86.5711
14	Netherlands	86.0419
15	Switzerland	85.3347
16	UAE	83.6673
17	Iceland	83.5351
18	Norway	83.0516
19	Ireland	82.9404
20	Germany	82.6809
21	Austria	82.3929
22	France	81.7544
23	Italy	81.4697
24	Belgium	80.4378
25	Thailand	79.6510
26	Russia	79.5482
27	Spain	78.7469
28	Hong Kong	76.5967
29	Oman	76.4807
30	Saudi Arabia	76.4124
31	Kazakhstan	75.2545
32	Philippines	73.2548
33	Malaysia	73.2088
34	Indonesia	72.9366
35	Uruguay	72.4353
36	Portugal	72.3409
37	South Africa	71.1474
38	India	70.5637
39	Colombia	70.5028
40	Israel	70.2476
41	Brunei	69.8509
42	Lithuania	69.5926
43	Czech	69.4843
44	Poland	69.2256
45	Vietnam	69.0893
46	Chile	68.2531
47	Mexico	68.1738
48	Turkey	67.8051
49	China	66.6266
50	Macau	66.2558
51	Georgia	65.9696
52	Bahrain	65.5004
53	Romania	65.2758
54	Kenya	63.8613
55	Argentina	60.4899
56	Egypt	59.2642
57	Peru	58.9727
58	Brazil	58.9361
59	Morocco	58.1522
60	Costa Rica	57.3152
61	Pakistan	56.9483
62	Nigeria	55.4067
63	Fiji	54.8498
64	Tunisia	54.2517

The following table summarizes all 10 indicators and sub-indicators in 35 fields under indicators.

Table 2. Key field evaluation 10 indicators and sub-35 indicator list

10 major survey items	35 Survey sub-items
Network infrastructure enhancement ・NIP (Building and maintenance of public network)	1-1 Internet subscribers 1-2 Broadband users 1-3 Digital mobile phone subscribers
Contribution to administrative and financial reforms, optimization of administrative management, MO (effects of EA, etc.)	2-1 Optimization progress 2-2 Integrated EA model 2-3 Administrative budget system
Progress of various online applications and services / OS (types and progress of online service activities)	3-1 Electronic bidding system 3-2 Electronic tax payment 3-3 Electronic payment / customs clearance system 3-4 eHealth system 3-5 One-stop service
Convenience of homepage and portal site ・NPR (Status of National Portal)	4-1 Navigation function 4-2 Two-way dialogue 4-3 Interface 4-4 Technical convenience
Government CIO (Chief Information Officer) Activity ・GCIO (Authority and human resource development)	5-1 Introduction of CIO 5-2 CIO Authority 5-3 CIO Organization 5-4 CIO Human Resources Development Plan
E-Government Strategy / Promotion Measures / EPRO (Achievement of the plan)	6-1 Legal response 6-2 Effective promotion business 6-3 Support mechanism 6-4 Evaluation mechanism
Enrichment of citizens' administrative participation by ICT・EPAR (Electronic participation of citizens)	7-1 Information sharing mechanism 7-2 Exchange / Discussion 7-3 Participation in decision making
Open Government OGD (Open data)	8-1 Legal response 8-2 Society 8-3 Organization
Cyber security / CYB	9-1 Legal response 9-2 Cybercrime measures

	9-3 Internet Security Organization
Utilization of advanced ICT/EMG	10-1 Cloud utilization 10-2 IoT utilization 10-3 Big data utilization

According to the "16th Waseda University Digital Government Ranking" survey, rapid DX development has been seen through various activities in many countries after the COVID-19 disaster. Table 1 shows the overall ranking of the 64 target countries.

According to the results of this 16th survey, Denmark regained first place, up one rank from last year's second place. Singapore came in second place and UK in third place, both also up one place from the previous ranking. The United States came in fourth place, a drastic drop of three ranks from first place last year. Canada in 5th place has grown dramatically from eighth place last year. Estonia came in sixth place dropping one rank from fifth place last year, and seventh place New Zealand jumped significantly from 13th place. South Korea came in eighth place and is one rank up from ninth place last year. Japan fell to ninth place after maintaining seventh place for the past two rankings in a row. Taiwan came in tenth place, up from 11th place last year. The penetration of DX brought about by the Covid-19 pandemic is strongly emphasized in this year’s ranking.

B. Top 10 Features of the World Digital Government Ranking 2021

The biggest feature of the world digital government ranking 2021 is that the digital support for COVID-19 had a great influence on the ranking.

[1st place: Denmark]

This time Denmark has reclaimed the number one spot since it last held it in 2018. Denmark's Covid-19 countermeasures under the jurisdiction of the Ministry of Finance (which prioritizes administrative and financial matters) include a "Corona Pass," which utilizes Denmark's information infrastructure as a digitally advanced country. From an early stage, Denmark developed and issued a digital certificate called the COVID-19 Pass, which spearheaded the introduction of compatible digital green certificates in the EU. It is available in Danish, English and French, and is successful because all procedures are completed online.

Denmark ranked first in the ranking in 2018, second in 2019/20, and also ranked first in the United Nations e-government ranking in 2020. Denmark is currently the world's most advanced digital government nation.

In October 2011, the Digitalization Agency was established in Denmark as an institution involved in digitization strategies to bring benefits to citizens and businesses, and it is now in its tenth year. The agency oversees digital strategies related to cloud, standardization, welfare, greening, etc.

The Digitalization Agency has the authority to promote cross-ministerial digitization and is an organization that has developed a data linkage platform. It is also active in decentralization reform, promoting cooperation between the central government and local governments, and the central government is also intervening in the data of local governments.

Looking back, Denmark established the CPR (Social Security Number) in 1968. The CPR is widely used by both the public and private sectors, including the medical, education, and welfare systems. In addition to the frequent use of personal numbers by related organizations, medical examination appointments, test result reports, and information on prescription drugs were shared on the medical portal site, which became the basis of the COVID-19 pass. Considering the way the system was designed from the user's point of view, as well as the speed with which the Corona Pass system was built, which the establishment and system design are highly evaluated.

In addition, according to the analysis results of 10 indicators (benchmarks), the degree of Denmark's network infrastructure is ranked second, the degree of contribution to administrative and financial reform is ranked first, the progress of various online application services is first, and the convenience of homepages and portal sites is first, the degree of fulfillment of citizens' administrative

participation by ICT is first, Open Government is first, Cyber Security is first, and so on. Denmark is ranked high in almost all the world's indicator items. The digital government ranking is a comprehensive rating, but one can see that Denmark is good for most of them.

[2nd place: Singapore]

Singapore has returned to second from third place last year. Digitization is positioned as the most important issue for the Singapore government's national strategy. It has the second highest digital competitiveness in the world in the "World Digital Competitiveness Ranking 2020" by IMD.

The strengthening of DX can be seen from the fact that about 20 US billion dollars will be invested in maintaining the competitiveness of the manufacturing industry and researching and developing innovative technologies to fulfill the goals set for 2025. Singapore is also focusing on attracting IT human resources, promoting IT human resources investment by introducing a new visa "Techpass" and advocating the Research, Innovation, Enterprise 2025 Plan as a strategy to strengthen R & D within 5 years.

In addition, as a measure against COVID-19, the introduction of Safe Entry (entrance / exit recording system) is obligatory for all businesses, and Singapore has succeeded in controlling infection by streamlining the identification of infected persons and close contacts.

This system also has contributed to the reduction of minor crimes and the maintenance and improvement of public order by visualizing public behavior. It has been evaluated by the public for its contribution to the pursuit of efficiency through digitalization and the construction of a safe and secure society, and it has earned the trust of vulnerable digital people such as the elderly. The digital government model can provide stakeholder-first services that meet the needs of citizens and businesses. Regarding the 10 benchmarks, the degree of activity of government CIOs, the degree of fullness of citizens' participation in government by ICT, open government, and cyber security are all ranked first, and the utilization of advanced ICT is ranked second.

[3rd place: UK]

The UK came in third place has improved from fourth place last year. Comprehensively examining the 10 indicators(benchmarks), the UK is making good progress. The degree of network infrastructure is sixth, the progress of various online application services is seventh, the convenience of homepages and portal sites is 2nd, the activity of government CIOs is fourth, and the strategy and promotion measures of e-government are eighth. The UK places high overall, with cyber security ranked tenth and advanced ICT utilization ranked 2nd. The UK managed to retain most of its benchmark ranks.

The National Health Service (NHS) oversees medical care, and DX conversion has progressed at once due to the COVID-19 disaster. In the intensive care unit (ICU), medical teams

communicate through a dedicated app that includes management of tasks, introduces a machine learning model, and measures the demand for ICU beds and ventilators, and the length of hospital stay for patients. It made predictions so that resources can be used more efficiently. Video conference tools have also been introduced to facilitate communication between doctors, patients and their families. In addition, about 1 million people have applied for "Universal Credit" for low-income earners. The UK government is successful in identifying the support recipients from the tax payment information, contacting them, and transferring the benefits soon after application.

[4th place: USA]

Although the United States ranked down from first place last year to fourth this year, the government CIO is ranked 1st, the degree of fulfillment of citizens' administrative participation by ICT is 1st, the utilization of advanced ICT is 1st, homepage, portal site convenience ranked second, and e-government strategy and promotion measures ranked eighth.

As a measure against COVID-19, the US adopted a method of transferring money directly to an individual's bank account with a social security number. Although US placed first in the 2020 ranking, the use of digital for COVID-19 countermeasures differed depending on the state, and the turmoil due to the influence of political and social division undermined the effectiveness of government response. Contact confirmation apps have been developed in each state, and "vaccine passports" that show vaccination history are currently being discussed, with conservatives voicing significant opposition on the grounds of privacy concerns. New York was the first state to introduce it at the end of March, but the Republican governors of both Florida and Texas have banned passport requirements, and the federal government has stated that it "does not support a system that requires carrying certificates." These legal and social barrier remains even if the technology is further developed.

So far, the United States has (1) focused on increasing employment in the mobile business sector, (2) the government has adapted to the new digital environment to unlock the value of government data and promote innovation, and (3) in order to streamline operations with a focus on AI, the White House issued an administrative order to maintain US leadership in AI in 2018, and three points that are highly evaluated in the digital government ranking. In addition, the announcement of the "American AI Initiative," a national strategy that maintains and strengthens scientific, technical, and economic leadership in AI, R&D and deployment, is affecting the utilization of advanced ICT.

[5th place: Canada]

Canada has made significant strides in digitization in the past few years. In the previous survey, Canada jumped to tenth place from 16th place the prior year. Canada has now risen all the way to fifth place in this year’s ranking. The Government of Canada is making a number of efforts to

improve digital government, including the latest Digital Operations Strategy Plan for 2018-2022 on DX, online services, cybersecurity, information management and information technology. Canada is proceeding with implementation focusing on the establishment of government integration guidelines. In 2019, the government also began promoting administrative reforms such as the Canada Cloud Implementation Strategy with the aim of expanding online services and minimizing application and infrastructure costs.

In Canada, policies are being promoted mainly by the Ministry of Digital Government. The Ministry of Digital Government was introduced as part of the Government of Canada under Prime Minister Justin Trudeau, and the Minister of Digital Government also oversees Shared Services Canada, the government sector responsible for managing and maintaining information technology services throughout the Government of Canada.

In addition, Canada manages the evolution of digital services and technology through the "Digital Operation Strategic Plan." It has been built and expanded based on the Government of Canada's Information Management and Information Technology Strategic Plan from 2017 to 2021. In the strategic plan the CIO directly sets the digital direction of the government and establishes the integrated direction of the government regarding DX, services, security, information management, and information technology.

Waseda University's D-government ranking has highly evaluated Canada for its contribution to administrative and financial reforms, cybersecurity, and advanced IT utilization, and the progress of various online application services. Canada ranked fifth for the activity of the government CIO, the seventh open government, and the convenience of the homepage / portal site was ninth place. Comprehensively evaluating the benchmarks, Canada performs well overall despite only a single metric in first place. Considering Covid-19 support, Canada has succeeded in rapid digital support, such as applying for benefits online and transferring stimulus to 7.55 million people within 10 days of the program.

[6th place: Estonia]

In sixth place is Estonia, which has had a great influence in the field of digital government around the world. Estonia is the only country in the world where 99% of public services are available online. The country has reached an unprecedented level of transparency in governance and has built up widespread trust in the digital world. This year, the government has introduced AI and cloud strategy, making it the most digitalized country in the world, and it is also the year to take the next step of digitalization to expand the ICT society.

Estonia with a population of 1.3 million, has always placed in the top 10 in the e-government world rankings since the rankings began. Estonia was under control of the Soviet Union in the past, after the collapse and breakup of the USSR in 1991, the newly independent government was forced to

maintain the communication infrastructure and Internet environment. In the following years, the construction of the system infrastructure led to repeated successes, and today 99 % of the administrative services can be completed online. The Electronic Residence Rights Bill passed in 2014 and makes it easy for anyone, regardless of nationality, to apply and open a local corporation or bank account, take advantage of virtual benefits as well as physical residence, such as being able to participate in the EU market.

Since the 2000s, Estonia has digitized many administrative procedures such as resident registration and tax payment and the ability to complete various services online 24 hours a day. With one national ID number, it can act as a driver's license or health insurance card, or as a tax ID to complete a tax return online in just a few minutes. Now over 95% of tax returns are completed online. In the 2019 parliamentary elections, online voting exceeded 40 Estonia’s highly rated benchmark evaluations include: first in the degree of contribution to administrative and financial reform, first in the degree of fulfillment of citizens' administrative participation by ICT, second in the convenience of homepages and portal sites, and the degree of progress of various online applications and services. third place in the ranking, sixth place in the activity of the government CIO, and sixth place in the cyber security.

[7th place: New Zealand]

New Zealand has created a special website for COVID-19 support in all 28 languages common in New Zealand, including sign language. New Zealand's e-government has a long history, going back to April 2001, the "E-government Strategy" had already been formulated, and updated versions were released in December 2001, June 2003, and later in 2006.

A networked and accessible national service was advocated and promoted with the aim of creating citizen participation in the government. In 2010 the "ICT Management and Investment Policy and Priority Plan" was announced. In 2012, the public service improvement program began, and various digitization measures started in earnest. At that time, New Zealand adopted a network-type leadership model called "Digital Government Partnership" centered on the government CIO and is promoting citizen-collaboration-type digital measures for the overall optimization of the nation.

New Zealand is also a major founder of the seven-country network "D7," which expands e-government efforts and discusses everything from AI ethics to privacy. "DIGITAL.GOV.NZ" is a portal site that collects information on digitization-related measures operated by the New Zealand Government. She has hosted APEC web meetings in 2021 which is very successful.

In terms of indicators, it ranked first in e-government strategy and promotion measures, first in open government, sixth in convenience of homepages and portal sites, sixth in cyber security, and eighth in contribution to administrative and financial reforms. It is ranked tenth in the degree of fulfillment of citizens' administrative participation by ICT and has received a relatively high evaluation.

[8th place: South Korea]

South Korea came in eighth place, down from sixth place two years ago, but up from ninth place last year. The main characteristic of South Korea's digital government is that it is led by digital government agencies that prioritize innovation. Among the main indicators, the progress of various online application services is ranked first, the network infrastructure is ranked fourth, the open government is ranked sixth, and the government CIO is ranked seventh. By improving the e-Gov Frame portal, 702 digital government projects are being promoted in local and central integrated management systems to provide policy information to businesses. The greatest strength of the South Korean digital government is that the central and local governments, which are the premise of digitalization, are linked and unified.

In South Korea, cyber security is promoted under various laws, regulations, and guidelines such as the IT Network Usage and Information Protection Promotion Law (Network Law) and the Personal Information Protection Law (PIPA). The Network Law plays an important role in promoting cyber security from the perspective of protecting personal information and strengthening data security of IT networks. PIPA functions as a personal information protection law by applying it in combination with the Network Law for all cases of privacy infringement including cyber-attacks and data leakage.

[9th place: Japan]

Japan had maintained seventh place previous two rankings, but this time it fell to ninth place. Japan's issues were exposed in response to COVID-19. Japan's structural weaknesses include the vertically divided administration of government offices that was exposed in response to Covid-19, the separation of e-government (central) and e-government (local), the financial and digital divide of local governments, and the shortage of ICT human resources.

Looking ahead to the future declining birthrate, super-aging society, and declining population, public-private integration and open innovation through digital utilization will greatly contribute to cost reduction and efficiency, improvement of administrative and financial reforms, and increasing the convenience of people's lives. The top priority of the digital government in the post-COVID era is to shift to a new lifestyle and promote administrative DX through powerful and rapid digitization. At the same time, it is important to provide economic revitalization and high-quality administrative services to protect the stability, security and safety of people's lives.

In Japan, the Digital Agency was established on September 1, 2021 in order to promptly and intensively promote measures related to the formation of a digital society and to promote the speedy management of administrative affairs. In the future, Japan should aim for overall optimization by digitizing central and local areas, rather than individual optimization. In that sense, the digital chief, CIO who has a strong decision-making ability, is also attracting attention. As of November 2021, the

issuance of My Number Cards (ID card), which support the digital government, is about 40%. In the future, Japan will improve the convenience of lives by adding functions of service applications such as health insurance cards.

Japan is ranked first in the degree of activity of the government CIO, fourth in the strategy and promotion measures of the e-government, and tenth in the degree of utilization of advanced ICT. This time as well, the government CIO is expected to play an active role and is highly evaluated to materialize the digital society by Society 5.0 strategy. In the future, it will be important to promote the provision of administrative services from the user's perspective and to the digital government with the standardization and efficiency of business processes and information systems in mind.

[10th place: Taiwan (Chinese Taipei in APEC)]

Taiwan came in tenth place and has improved from 11th place in the previous ranking. In terms of indicators, it ranked first in open government, first in e-government strategy and promotion measures, fifth in contribution to administrative and financial reforms, and eighth in the degree of fulfillment of citizens' administrative participation through ICT. It is highly evaluated as the fifth place in the utilization of advanced ICT. The mask map by Minister Audrey Tan, who was highly evaluated worldwide for COVID-19 measures, was the background of the high evaluation in the strategy and promotion measures of open government and e-government.

In Taiwan, a citizen advocacy group called Civic Tech are actively taking part in social issues of administrative services by utilizing technology. This is a successful example of open government. The government portal site "My E-Government" has been devised so that citizens can easily access the information and procedures they need, and it serves as a model for the digital government.

[11th place: Australia]

Australia fell sharply from sixth place in the previous ranking to 11th place. The government has sought to build a digital identity system for users with the goal of making great strides with DX by 2025. The Australian Government has set a goal of providing world-leading digital services to benefit all people by 2025 through a digital strategy, but this time it is downgraded. On the other hand, in terms of indicators, it is ranked eighth in terms of contribution to administrative and financial reforms and eighth in open government.

[12th place: Sweden]

Sweden has gradually slipped from eighth place two years ago, tenth place in last year's ranking, to 12th place this time. The "Comprehensive Cyber Security Measures Plan" was implemented at the government agency level in March 2019 and has been highly evaluated in terms of digital government indicators.

In the Nordic Mobility Action Program, the Swedish government is accelerating the implementation of the eIDAS (Electronic Personal ID Card) a project in collaboration with the Nordic and Baltic states that is still ongoing. Citizens of Scandinavian and Baltic countries can use their electronic IDs to access public services when migrating, working or studying abroad in other countries in the region. To expand the application of DX, the Swedish government and local governments are moving towards improving both social and medical services with a vision by 2025.

In Sweden, many efforts are being made by the central and local governments to promote the digital government. In October 2015, the Digital Government Advisory Board was established, consisting of high-level public sector decision makers, to advise on digital government policy. Regular meetings and events are held at the local government level to promote the digital government.

In terms of indicators, it is highly evaluated as second for convenience of homepages and portal sites, eighth for network infrastructure, and eighth for open government.

[13th place: Finland]

Finland, which prioritizes administrative and financial reforms, has risen two ranks from 15th place last time. The European Commission's annual Digital Economy and Society Index (DESI) is driven by a wealth of digital human resources, including being ranked number one under COVID-19, work style reforms have progressed, and the operating rate of remote work in 2020 reached about 60%, the fastest in Europe. The AI-based administrative service "Aurora AI" is also expected to start operation at the end of 2022.

In terms of indicators, the degree of utilization of advanced ICT ranked fifth, the convenience of homepages and portal sites ranked sixth, the degree of fulfillment of citizens' administrative participation by ICT ranked sixth, and the progress of various online application services seventh.

[14th place: Netherlands]

The Dutch e-government has improved dramatically in the last few years with a focus to sustainable development goals. It increased from its previous 20th place to 14th place.

Since the launch of digital public services in the Netherlands in 1994, the government has focused on citizens' electronic participation and sought to provide faster services as part of their efforts to participate in the decision-making process.

In 1998, the E-Government Action Program was launched by the Ministry of Interior and the Ministry of Kingdom Relations. Nine principles (high cost-effectiveness, compatibility with existing structures, privacy, inter-sectoral, ICT utilization, multi-channel, private sector collaboration, integration to achieve more efficient and effective e-government financial responsibility) were adopted. The DigiD app was released in July 2017, with over 340 million DigiD certifications within two years.

The Dutch electronic ID distinguishes between DigiD, which is an electronic ID for citizens, and eHerkenning, which is an electronic ID for businesses. In addition to this, the national electronic invoice service is also in place.

The highly transparent citizen portal Mijn Overheid is the point of contact for data viewing.

In terms of indicators, it is ranked seventh in terms of network infrastructure, tenth in terms of convenience of homepages and portal sites, and eighth in open government.

[15th place: Switzerland]

Switzerland has dropped one rank from 14th last year to 15th this year.

As part of the Swiss government's DX efforts, the Federal Council's "Digital Swiss Strategy" initiative is updated every two years. This strategy was adopted on September 11, 2020. It provides guidelines for government action on digitization and serves as an orientation framework for other digital Swiss stakeholder, including economics, science and civil society.

Specifically, it will improve the management of patient electronic data in medical use, digitize patient records and secure access for medical professionals, and strengthen personal data protection. Ensuring transparency by strengthening cyber security and utilizing AI is also recommended. The purpose of DX is also one of the important factors for realizing the SDGs set by the United Nations.

Efficient business procedures and equal political participation for all people and businesses through digitization of politics and administrative services, interactive politics with transparency and relationships with people, efficiency of central and local governments the Swiss are also focusing on the realization of such cooperation.

In addition, it is also focusing on environmental protection, with the aim of optimally utilizing digitization for climate and environmental protection by the end of 2021, the Federal Environment Agency, Ecological Cycle Assessment and Energy. It tries to show how to improve the basics of consumption and footprint calculation.

As a digital economic policy, the Swiss are focusing on the enhancement of the sharing economy, digital finance, research and development, trade relations and competition policy by the end of 2022.

Digital applications have played an important role in the influence of COVID-19. However, there are weaknesses in digital utilization as a countermeasure against COVID-19, and it is necessary to improve it.

In terms of indicators, Switzerland is highly evaluated as No. 1 in cyber security, No. 5 in terms of network infrastructure enhancement, and No. 5 in terms of utilization of advanced ICT.

[16th place: United Arab Emirates]

The UAE has evolved dramatically from 22nd place last year to 16th place. The UAE's national digital government strategy looks at the realities of the post-COVID-19 world, and it was formulated with eight points in mind:1: no one is left behind, 2: elasticity, 3: fits into the digital age, 4: user perspective, 5: design, 6: data driven, 7: default, 8: policy that emphasizes positiveness. The UAE emphasizes open and comprehensive processes, accessibility, transparency, and accountability, and are also focusing on dealing with the elderly and other digitally vulnerable people.

World-class digital infrastructure installation, platforms, securing human resources, and ICT law are also set as goals, and priorities and roadmaps are established for each index. The government has also set goals such as adopting 80% of digital services by 2021 and improving the financial efficiency of government services by 20%.

In terms of indicators, UAE is highly evaluated as No. 1 in the degree of fulfillment of citizens' administrative participation by ICT, No. 6 in the degree of progress of various online application services, and No. 9 in the degree of fulfillment of network infrastructure.

[17th place: Iceland]

Iceland has risen significantly from 21st place last year to 17th place. The level of digital support through COVID-19 was highly evaluated. In April 2020, Iceland started the operation of an infected person tracking application "Rakning C-19" as one of the infection control measures and prevented the spread of infection through early detection and quarantine. According to the 2018 OECD statistics, the average of online administrative procedures in the OECD was 39.3%, while Iceland was at the top with about 80%. The penetration rate of broadband Internet is almost 100%.

Although Iceland is a small country, it has a long history of digital government. Services have also shifted to the cloud native service model and have grown. Most of the government services are also provided through websites, including e-government portals, important public service sites such as tax collection and payment, and voting registration.

Iceland first used the public cloud in 2005 and has been running public infrastructure (IaaS) as a large-scale service since 2008. This is a factor in the success of evolution such as improvement of labor productivity, cost reduction, and improvement of security.

In terms of indicators, Iceland is highly evaluated as the third place in the degree of network infrastructure and the third place in the progress of various online application services, which shows the result of the progress of the digital government in Iceland.

[18th place: Norway]

Norway dropped from 12th last year to 18th this year. Norge.no links to digital public services across all Norwegian sector and government levels. The central government and many

municipalities are digitally networked with citizens, and Norway has important sources of information for citizens as well. Citizens have an electronic ID.

The Norwegian secure digital mailbox scheme advances paperless procedures and allows citizens to receive official documents digitally. Open data is available from the National Data Catalog, data.norge.no and contains national and local public agency information, including relevant hierarchical data, contact information data, and geographic location data.

To become the best digital nation in the world, Norway will leverage renewable energy, low electricity prices and digital infrastructure to step up its commitment to sustainable data centers, create jobs and develop digital services.

In terms of indicators, it is ranked first in terms of network infrastructure and sixth in cyber security.

[19th place: Ireland]

Ireland has jumped almost ten places from 28th place last year to 19th place this year.

In December 2020, Ireland signed the "Berlin Declaration on Digital Society and Value-Based Digital Government" adopted by the EU. This Declaration ensures that DX is based on strong common democratic and ethical values and a set of specified principles. The Irish government keeps in mind that this will take advantage of new technologies for common benefit.

As a measure against COVID-19, Covid Tracker was created. My Gov ID is a government digital authentication and common ID framework. Online services will be provided by expanding the e-ID system. The number of My GovID account owners has doubled over the past year. While most of the population is registered with My Gov ID accounts, the problem is that they are late in providing online services. Notably, the Minister of Digital Government and the Greens see Europe's digital transformation as a focus on the 2030 Agenda for Sustainable Development, the Paris Agreement, and the European Green New Deal. They recognize that the integrated introduction of digitalization and greening will increase the credibility of the government and contribute to its advancement.

In terms of indicators, the degree of activity of the government CIO is evaluated as seventh.

[20th place: Germany]

Germany has dropped three ranks from 17th place last year. Overall, there is a delay in the progress of the digital government, especially in the fields of digital services, e-Payment, user satisfaction, open government, and etc.

A recent OECD study also shows that Germany retains huge economic opportunities, leaving e-government and open data almost undeveloped, despite the basic prerequisites for smarter cities. In addition, in the field of data-driven public sector, it was the lowest among OECD countries. Currently, the open data strategy is being adopted and the e-government law is being amended, and

Germany is heading toward recovery. Meanwhile, in the area of smart cities, which are closely related to the digital government, the German market is projected to more than double to € 84.7 billion by 2026. Smart cities are expected to promote investment and the creation of start-up companies.

The decentralized system, which is said to be one of Germany's strengths, has been a detriment in digitization along with COVID-19 delays. It is expected that ministries and agencies will be established to promote DX in the future. There was no index benchmark that was evaluated within tenth place.

[21st place: Austria]

Austria moved up three places from 24th place last year. One of the government's earliest and most important digitization projects was the e-Autonomy Act (e-GovG), which came into effect on March 1, 2004.

The main elements of E-GovG are the establishment of one-stop shop points for citizens to contact authorities, the signature on digital citizen cards or mobile phones that act as digital IDs, the electronic distribution of official documents and letters, a standard document register containing data on important citizen documents (birth certificate, wedding certificate, residence certificate, etc.).

E-government and efforts in the field of digitalization have long made Austria one of Europe's most successful countries in digitalization. On the other hand, there is some confusion in digitalization during COVID-19, and according to the Digital Economy and Social Index issued by the European Commission, Austria provides digital public services to companies, although it is slightly above the EU average, it ranks 13th and lags behind innovative countries. According to a survey conducted by the Austrian Institute of Economic Research in May 2021, Austria's strength is said to be the digital public service provided to its citizens.

In terms of indicators, it is ranked first in cyber security and eighth in contribution to administrative and financial reforms.

[22nd place: France]

France has dropped four ranks from 18th place last year. In terms of indicators, the degree of fulfillment of citizens' administrative participation by ICT is evaluated as the sixth in the world.

The personalized eID service developed by the French government is called e-ID France Connect and can be used for both public and many private services. Pro Connect is a future eID system for enterprises that was piloted in the fourth quarter of 2020 and was expected to be rolled out thereafter. In the field of ePayment, since mid-October 2018, the Directorate General of Finance (DGFiP) has provided public institutions and users with an enhanced, secure and up-to-date online payment service called PayFiP. PayFiP allows you to pay invoices issued by local governments and public institutions (states, local governments, hospitals, etc.) with bank deposits.

[23rd place: Italy]

Italy jumped from 27th last year to 23rd this year. E ID SPID is a solution that allows users to access all online government services from their electronic devices using a single digital ID. The legal officer of the organization can apply for and use a digital ID SPID to access online services. It is also possible to equip employees with digital IDs for corporate professional use.

ePayment's PagoPA enables citizens and businesses to make electronic payments to governments based on the rules, standards, and tools defined by the Agency for Digital Italy (AgID) and accepted by government agencies, banks, post offices, and more. Citizens can view the data contained in the National Register (ANPR) by logging in to the ANPR website, and transparency is maintained.

[24th place: Belgium]

Belgium went up one rank from 25th to 24th this year. This time, Belgium was ranked tenth in the progress of various online application services and fifth in the utilization of advanced ICT in the index.

The Belgian government is considering creating an online wallet for all people living in Belgium, providing all official documents, from visas to marriage certificates, to simplify the management process. We are investing in the construction of digital platforms that users can comfortably use, including digital wallets, and the enhancement of applications. The digital government from the user's point of view is evaluated by services such as these digital wallets.

As of January 2021, Belgium has a population of 11.61 million and Internet users in the same month of 10.57 million. The number of users increased by 158,000 (+ 1.5%) between 2020 and 2021. The Internet penetration rate in Belgium is over 90%, and the ICT penetration rate is increasing.

[25th place: Thailand]

Thailand has risen a notch from 26th place last year. In terms of indicators, the degree of contribution to administrative and financial reform and the optimization of administrative management were evaluated in fifth place.

The core of Thailand's National Development Plan, Thailand 4.0, is to enable transparent governments to use digital technology to provide access to public services and data.

Thailand's digital government is helping to increase access to public sector data for both citizens and businesses to lead the digitization of the private sector and promote the country's overall economic competitiveness.

In addition, the "Thailand 4.0" National Development Plan promotes the adoption and innovation of digital and automation and robotic technologies among SMEs, manufacturing

companies and service sectors. In addition, the Thai government can enjoy technological opportunities for the state to improve the quality of life of its citizens, participation in governance, and strengthening of the state's economic competitiveness through initiatives such as smart city development projects and big data platforms.

The Thai government opened "Village Broadband Internet" in 2017 to make Internet access more equitable for citizens and made all 74,987 villages accessible to high-speed Internet networks. This will give users access to government e-services, e-commerce, e-business and e-banking applications related to healthcare and online government.

The Thai government's digital government policy has been strengthened by the Digital Government Administration and Services Act BE 2262 (AD 2019) to ensure social and economic fairness, economic competitiveness, government transparency and people's participation. The framework is also consistent with the ASEAN Digital Master Plan 2025. The Digital Government Development Agency (DGA) is entrusted by law to advance the implementation of digital government. COVID-19 is accelerating the digital government architecture among government agencies. Among the key measures were designed to reduce the burden of private sector documentation, improve efficiency, and facilitate the use of digital IDs, including digital signatures between government agencies.

C. Top 10 countries (economy) in characteristic sector indicators

The World Digital Government Rankings are based on a comprehensive index analysis to provide a detailed and accurate assessment of the latest digital government developments in the ICT sector of all target countries. Currently, 10 key indicators are used to conduct digital government ranking surveys. The following table summarizes the indicators for all 10 items and the sub-indicators in the 35 fields below them.

The following table summarizes all 10 indicators and sub-indicators in 35 fields under their umbrella.

Table 3. Key field evaluation indicators and sub-35 indicator list

10 major survey items	35 Survey sub-items
Network infrastructure enhancement ・NIP (Building and maintenance of public network)	1-1 Internet subscribers 1-2 Broadband users 1-3 Digital mobile phone subscribers
Contribution to administrative and financial reforms, optimization of administrative management, MO (effects of EA, etc.)	2-1 Optimization progress 2-2 Integrated EA model 2-3 Administrative budget system
Progress of various online applications and services / OS (types and progress of online service activities)	3-1 Electronic bidding system 3-2 Electronic tax payment 3-3 Electronic payment / customs clearance system 3-4 eHealth system 3-5 One-stop service
Convenience of homepage and portal site ・ NPR (Status of National Portal)	4-1 Navigation function 4-2 Two-way dialogue 4-3 Interface 4-4 Technical convenience
Government CIO (Chief Information Officer) Activity ・GCIO (Authority and human resource development)	5-1 Introduction of CIO 5-2 CIO Authority 5-3 CIO Organization 5-4 CIO Human Resources Development Plan
E-Government Strategy / Promotion Measures / EPRO	6-1 Legal response 6-2 Effective promotion business

(Achievement of the plan)	6-3 Support mechanism 6-4 Evaluation mechanism
Enrichment of citizens' administrative participation by ICT・EPAR (Electronic participation of citizens)	7-1 Information sharing mechanism 7-2 Exchange / Discussion 7-3 Participation in decision making
Open Government OGD (Open data)	8-1 Legal response 8-2 Society 8-3 Organization
Cyber security / CYB	9-1 Legal response 9-2 Cybercrime measures 9-3 Internet Security Organization
Utilization of advanced ICT/EMG	10-1 Cloud utilization 10-2 IoT utilization 10-3 Big data utilization

The evaluation for each index is as follows.

1. Network Preparedness/Infrastructure (NIP)

Three sub-indicators are used to evaluate the digital government in terms of " Network Preparedness". Internet users are an important sub-index for assessing a country's online application services. Today, the development of wireless broadband, especially 5G, has become mainstream.

Infrastructure development has already been deployed and applied in many countries. This will be of great help to developing countries in terms of increased high-speed connectivity, evolution of infrastructure over wide bandwidths, and the adoption and progress of digital government strategies, reducing the digital divide between developed countries.

This time, Norway has a very high digital penetration rate and is the top in this indicator. Norway has a well-developed infrastructure such as ICT networks necessary for the digital government and is ranked as high as it was last year because of the interoperability of the system and the possibility of mass exchange of data between the ministries and agencies of the government.

Norway has also been focusing on greening from an early stage, with the government focusing on "green IT" solutions to continuously expand its ICT infrastructure in order to provide a healthier environment for all. Norway is promoting PPP with the private sector.

Denmark, which boasts an Internet penetration rate of 98%, has been highly evaluated for its infrastructure, the same case as last year. The Danish government is working to lay the foundation for companies to leverage digital technology and position the country as a digital front runner and has already introduced the 5G Action Plan in 2019.

Table 4. Network infrastructure enrichment (NIP)

Ranking	Country/economy	NIP-Score
1	Norway	8.0348
2	Denmark	8.0316
3	Iceland	8.0186
4	South Korea	8.0020
5	Switzerland	7.9877
6	UK	7.8438
7	Netherlands	7.8417
8	Sweden	7.8382
9	United Arab Emirates	7.7604
10	Hong Kong	7.6903

2. Management Optimization/Efficiency (MO)

"Management Optimization" is an important indicator of the government's optimal behavior in the operation and implementation of digital government ICT. It is evaluated by the strategy for project implementation and ICT application development. This index also evaluates new technologies that are optimal for promoting online services. Digital policy and system architecture settings are also factors for all governments to consider moving to a digital model.

This indicator assesses the degree of ICT utilization to improve government business and internal processes (back offices of each organization). Government management optimization is an important indicator for digital government development as it is related to optimization progress, integrated enterprise architecture (EA), and government management budget system.

In this ranking, Denmark, Canada, Estonia and Japan were tied for the top position with the same score.

Table 5. Contribution to administrative and financial reform, optimization of administrative management (MO)

Ranking	Country/economy	MO-Score
1	Denmark	12.000
1	Canada	12.000
1	Estonia	12.000
1	Japan	12.000
5	Singapore	11.900
5	Taiwan	11.900

5	Thailand	11.900
8	New Zealand	11.800
8	Australia	11.800
8	Austria	11.800

3. Online Services/Functioning Applications (OS)

"Online Services/Functioning Applications" is a key indicator of the development of digital government. The achievements of the digital government include electronic services, or products / services that the government provides to citizens, and positions electronic services as the interface of the digital government.

The growth of the nation as a digital government is measured by the increase in online services and the level of services (information, download forms, transactions, electronic payments). The Digital Government Ranking currently evaluates five major online services, including e-procurement, electronic tax payments, electronic payments, one-stop services, and e-health. These are the basic services among online services. In order to cover and better evaluate online services, the institute plans to expand many online service evaluations in future rankings.

In this ranking, Denmark and South Korea ranked first. They have obtained full scores for all items. The UAE has been in the top 10 since last year. UAE can be seen strengthening online services.

Table 6. Progress of various online applications and services (OS)

Ranking	Country/economy	OS-Score
1	Denmark	12.000
1	South Korea	12.000
3	Estonia	11.760
3	Iceland	11.760
5	Canada	11.640
6	United Arab Emirates	11.400
7	Singapore	11.340
7	UK	11.340
7	Finland	11.340
10	Belgium	11.310

4. National Portal/Homepage (NPR)

A national portal (one-stop service) is defined as a place where governments can integrate all e-services and access them through a single gateway. It is also the primary interface for stakeholders to access government electronically.

Through national portals, governments provide users of public services with many benefits, from citizens and businesses to the public managers themselves, including faster, cheaper and better services. One-stop services in the public sector are one of the most promising concepts of service provision in government. The implementation of national portals is included in the digital government strategies of most countries.

In this ranking, Denmark is ahead of the others and ranked first. The United Kingdom, the United States, Estonia and Sweden follow in second place with the same score.

Table 7. Convenience of homepage and portal site (NPR)

Ranking	Country/economy	NPR-Score
1	Denmark	8.727
2	UK	8.000
2	USA	8.000
2	Estonia	8.000
2	Sweden	8.000
6	New Zealand	7.867
6	Finland	7.867
6	Chile	7.867
9	Canada	7.852
10	Netherlands	7.733

5. Government CIO(GCIO)

In this digital government ranking, the government CIO index has been introduced as an important index in the evaluation of digital governments in each country for the first time this year. Government CIOs are expected to balance digital strategy, organizational reform and overall optimization, play an important role in planning and implementation, and in recent years are also expected to focus on digital government DX. Government CIOs will lead DX efforts and implement digital technology, research, and workflow methodologies to bring speedy digital transformation to government agencies. This indicator assesses the role of the Information Technology Department in digital government planning, development, and implementation, as well as its contribution to the transformation of traditional management models into DX applications.

Table 8. Government CIO Activity (GCIO)

Ranking	Country/economy	GCIO-Score
1	Singapore	10.000
1	USA	10.000
1	Japan	10.000
4	UK	9.545

5	Hong Kong	9.318
6	Estonia	9.091
7	Canada	8.182
7	South Korea	8.182
7	Ireland	8.182
10	Denmark	8.000

This time, Singapore, the United States and Japan got the highest scores. Singapore and the United States continue hold the number one rank from last year. In Japan, the Digital Agency was established on September 1, 2021. Along with that, the name of Government CIO position became the “Digital Officer”. The Digital Officer is a position equivalent to the Administrative Vice-Minister in other central ministries and agencies, assists the "Digital Minister" who oversees the Digital Agency under the Prime Minister, and supervises the overall operations of the Digital Agency. Against the background of the authority of the Digital Agency, the Digital Officer is expected to play a role in demonstrating leadership in comprehensive coordination through joint projects with each ministry and promoting administrative DX by making use of experience in the private sector. This point was highly evaluated, and Japan ranked first in this indicator this time.

6. D-government Promotion (EPRO)

This indicator measures government activity towards promoting digital government and distributing e-services to citizens, businesses and other stakeholders. This includes activities related to supporting the implementation of digital government, such as legal frameworks and mechanisms (laws, plans, policies, strategies). These activities are carried out by the government to support the development of electronic services and the development of the digital government as a whole.

New Zealand and Taiwan have won first place due to the success of their digital strategy in combatting COVID-19. Continuing from the previous time, Japan ranked fourth in the promotion index of the digital government. The government has succeeded in promoting services and utilities that use the Internet to provide public services. In addition, with the establishment of the Digital Agency, the action plan of the digital government has been updated, and it is highly evaluated that it will be strategically promoted, such as cooperation between the central and local governments, standardization of systems, and utilization of advanced technology.

Table 9. Digital Government Strategy and Promotion (EPRO)

Ranking	Country/economy	EPRO-Score
1	New Zealand	10.000
1	Taiwan	10.000
3	Netherlands	9.839

4	Singapore	9.677
4	Japan	9.677
6	Denmark	9.516
6	Kazakhstan	9.516
8	UK	9.355
8	USA	9.355
8	Hong Kong	9.355

7. E-participation /Digital Inclusion (EPAR)

Citizen participation in government through ICT is one of the application examples of ICT to expand participation in digital government. When people can connect and speak to government through digital projects, the administrative policy process becomes more transparent and consistent. This process may involve management, service delivery, decision making, and policy making.

In this ranking, Denmark, Singapore, the United States, Estonia and the United Arab Emirates each are tied for the highest rating. Denmark has succeeded in digitizing almost 100%, while providing a hybrid service that retains the conventional administrative services for the vulnerable and elderly.

Estonia has already fully fulfilled its role as a leading country for the digital government, and the laying of broadband, digital strategy, and attraction of business investment play a part in the country's digital strategy. There were differences in the administrative participation of citizens in COVID-19 measures in each country.

Table 10. Enrichment of Citizens' Participation in Government by ICT (EPRA)

Ranking	Country/economy	EPAR-Score
1	Denmark	10.000
1	Singapore	10.000
1	USA	10.000
1	Estonia	10.000
1	United Arab Emirates	10.000
6	Finland	9.800
6	France	9.800
8	UK	9.600
8	Taiwan	9.600
10	New Zealand	9.500

8. Open Government (OGD)

Open government is a barometer of the openness of specific government data to citizens, businesses, and other ministries. Denmark, Singapore, the United Kingdom, New Zealand and Taiwan are at the top of the ranking. This time Taiwan has made great strides.

The United Kingdom has earned a high reputation as a digitally advanced country. Most administrative procedures have already been completed online in the UK. It has been ranked second in the 2019 OECD Digital Government Index and first in the 2016 World Wide Web Foundation Open Data Barometer. The websites of each UK government agency are integrated into GOV.UK, and you can apply for various subsidies and passports. In addition, the National Health Service of the UK medical system has its own website, and COVID-19 was able to complete the vaccination reservation/ change procedure on that website. One of the factors behind the success of digitalization in the UK is the collaboration with private businesses through open government.

Table 11. Open Government (OGD)

Ranking	Country/economy	OGD-Score
1	Denmark	10.000
1	Singapore	10.000
1	UK	10.000
1	New Zealand	10.000
1	Taiwan	10.000
6	South Korea	9.900
7	Canada	9.800
8	Australia	9.750
8	Sweden	9.750
8	Netherlands	9.750

9. Cyber Security (CYB)

An important issue in promoting digital government is cyber security. Sufficient security measures have been taken in Denmark, Singapore, Canada, Switzerland and Austria, which were tied for first place this time.

Also, although not ranked in the top ten this time, the latest US State Department report has announced that it will create a cyber-station to take charge of cyberspace and digital policy. The United States has announced a policy of strengthening its response to cyber-attacks as ransomware attacks on infrastructure become more serious. The US cyber bureau has "cyber security" that includes negotiations and deterrence with allies and hostile countries, a "digital policy" that promotes the creation of reliable communication networks, and "digital freedom" that protects human rights online. In these three fields, future progress is expected.

Table 12. Cyber Security (CYB)

Ranking	Country/economy	CYB-Score
1	Denmark	10.000
1	Singapore	10.000
1	Canada	10.000
1	Switzerland	10.000
1	Austria	10.000
6	Estonia	9.900
6	New Zealand	9.900
6	Iceland	9.900
6	Norway	9.900
10	UK	9.800

10. The use of Emerging ICT (EMG)

The role of innovation in this area is to serve all citizens and businesses using the Internet and telecommunications networks. Today, the development of many new technologies, such as the IoT, helps people access government services through a variety of devices such as computers, smartphones and tablets. Cloud computing also helps facilitate connections between governments and citizens. Big data helps governments optimize their services. Therefore, it is believed that these technologies should always be implemented by the government in the highest priority.

The United States, which has Silicon Valley, is the base for application creation, was ranked first as it was last year. The United States has also appointed a new envoy in charge of emerging technologies to promote government digitization and has begun coordinating international policies on artificial intelligence, quantum computers, biotechnology and more. Singapore and the United Kingdom were ranked second.

In Japan, the use of advanced technologies such as smarter local public organizations, digital administrative services utilizing AI and RPA, etc., contributing to cost efficiency, work style reform, digital investment, and optimal allocation of human resources, etc. was evaluated and entered the tenth place.

Table 13. Advanced ICT Utilization (EMG)

Ranking	Country/economy	EMG-Score
1	USA	7.500
2	Singapore	7.000
2	UK	7.000
4	Canada	6.500
5	Denmark	6.000

5	Taiwan	6.000
5	Finland	6.000
5	Switzerland	6.000
5	Belgium	6.000
10	Japan	5.500

D. Ranking by international organization and region

1. Digital Government Ranking in APEC Economy

Japan dropped from fourth place in the previous year to sixth place. New Zealand and South Korea, which attracted attention for COVID-19 measures, came in fourth and fifth place. Chinese Taipei ranked seventh as before, and Thailand ranked ninth as an ASEAN other than Singapore. Instead, Hong Kong dropped from the top ten. In the lower ranks, China, which was 15th in the previous year, came in 19th, following Indonesia, Vietnam, Mexico, and Chile. Brunei, 13th last year, dropped to 15th and became a lower group. Vietnam, Mexico, Chile and Peru have some fluctuations in ranking but no major changes.

Table 14. Digital Government Rankings in the APEC Economy

Ranking	APECEconomy	7	Chinese Taipei	14	Indonesia
1	Singapore	8	Australia	15	Brunei
2	USA	9	Thailand	16	Vietnam
3	Canada	10	Russia	17	Chile
4	New Zealand	11	Hong Kong	18	Mexico
5	Korea	12	Philippines	19	China
6	Japan	13	Malaysia	20	Peru

2. Digital Government Rankings in OECD Countries

In the OECD group, the top three are Denmark, the United Kingdom, and the United States in that order. Australia, which was in the top 5 of the previous year, dropped to 9th place, and Canada, which was 7th last year, moved up to 4th place, and Estonia moved from 4th to 5th place.

Japan ranked down from 6th place to 8th place in the previous year. New Zealand and South Korea came in there. New Zealand is up 5 ranks from 11th place in the previous year. Notable moves in the middle group include the rise of 4 ranks in the Netherlands and the downgrade from 10th to 15th in Norway. Turkey stands out in the lower group, from 24th in the previous year to 29th (lowest in this group).

Table 15. Digital Government Rankings in OECD Countries

Rank	OECD countries
1	Denmark
2	UK
3	USA
4	Canada
5	Estonia
6	New Zealand
7	South Korea
8	Japan
9	Australia
10	Sweden
11	Finland
12	Netherlands
13	Switzerland
14	Iceland
15	Norway
16	Ireland
17	Germany
18	Austria
19	France
20	Italy
21	Belgium
22	Spain
23	Portugal
24	Israel
25	Czech
26	Poland
27	Chile
28	Mexico
29	Turkey

3. Digital Government Rankings in European Countries

Denmark, the United Kingdom and Estonia remained in the top three, unchanged from the previous year. The rank will be maintained continuously from 2018. Sweden in 4th place also maintained the previous year. Here, the rise from the 10th place in the previous year to the 6th place this year is conspicuous. In the middle group, Germany and France dropped out of the top 10, and France moved from 9th to 13th in the previous year. Iceland (8th) and Ireland (10th) ranked in instead. Ireland was 15th in the previous year. In the lower group, Lithuania, which was the lowest 21st place last year, has risen to 18th place.

Table 16. Digital Government Rankings in European Countries

Rank	European countries
1	Denmark
2	UK
3	Estonia
4	Sweden
5	Finland
6	Netherlands
7	Switzerland
8	Iceland
9	Norway
10	Ireland
11	Germany
12	Austria
13	France
14	Italy
15	Belgium
16	Spain
17	Portugal
18	Lithuania
19	Czech
20	Poland
21	Romania

4. Digital Government Rankings in Africa, Middle East and CIS Countries

The top three countries are United Arab Emirates, Russia, and Oman in that order. Oman rose from 6th place to 3rd place last year. Kazakhstan, which had been leading the group until the previous year, has been downgraded to 5th place. It is also noteworthy that Saudi Arabia, which was 10th in the previous year, rose to 4th place and South Africa, which was 12th in the previous year, to 6th place. On the other hand, Morocco, which was the only African group to rank in 9th place last year, came in 13th place.

The DX of the United Arab Emirates (UAE) is noteworthy, as evaluated by national indicators. It can be said that it is a country that has succeeded in promoting digitalization at a rapid pace in the Corona disaster. In 2018, the Communications Regulatory Authority (TRA) aimed to build a framework for the maturity stage of the digital government through the " UAE Digital Government Maturity Project". By 2021, we aim to improve medical care in terms of quality, provide medical services to become one of the world's highest level countries, and build a safe and powerful cyber security infrastructure for DX. We are updating the "National Cyber Security Strategy" for the purpose of this.

Table 17. Digital Government Rankings in Africa, Middle East and CIS Countries

Ranking	Africa / Middle East / CIS countries
1	United Arab Emirates
2	Russia
3	Oman
4	Saudi Arabia
5	Kazakhstan
6	South Africa
7	Israel
8	Turkey
9	Georgia
10	Bahrain
11	Kenya
12	Egypt
13	Morocco
14	Nigeria
15	Tunisia

E. Digital Agencies of 15 major countries

1. World-class digital policy and digital agency

Digital Agencies have become popular around the world. This report analyzes the characteristics of Digital Agencies in 15 countries(economies): Australia, Canada, China, Denmark, Estonia, Finland, Germany, Russia, Singapore, South Korea, Sweden, Taiwan, Thailand, the United Kingdom, and the United States. Below is a list of digital ministries and agencies in each country (economy).

Table18. Digital government-related promotion organization

1	[Denmark] Agency for Digitization (Ministry of Finance)
2	[UK] The Government Digital Service
3	[Singapore] Govtech, Inforcomm Media Development Authority (IMDA)
4	[Finland] Ministry of Finance
5	[Estonia] Economical communication
6	[Australia] Digital Transformation Agency
7	[South Korea] Ministry of Interior and Safety (MOIS)
8	[Sweden] Agency for Digital Government
9	[China] State Council for the Department of Industry and Telecommunications
10	[Russia] Digital development, communications and mass media
11	The [U.S.] GSA, US Digital Service
12	[Canada] Digital Service
13	[Taiwan] Digital Agency
14	[Germany] The Federal Department of the Information Security
15	[Thailand] Digital Government Development Agency (DGA)

(1) Denmark

In the Waseda University Digital Government Rankings, Denmark was ranked 1st in 2018, 2nd in 2019/20, and now 1st in 2021. Denmark also topped the United Nations ranking in 2020. Denmark's relevant agency is The Agency for Digitization, a subdivision of the Ministry of Finance. The Agency for Digitization (DA) is an institution involved in digitization strategies to benefit citizens and businesses. The DA was launched in October 2011. The Waseda University team and the DA have had meetings at DA's Copenhagen headquarters twice to exchange views on digitalization. The DA oversees ICT strategies such as D-government, cloud computing, standardization, digitization in the

health and welfare fields, and Green IT.

The Danish Agency for Digitization has the authority to promote digitization across ministries. In addition, the government takes the initiative in establishing a mechanism and data linkage platform to ensure the reliability of information and ability to cross-reference between organizations. They will also actively work on decentralization reform. The DA strategy builds a unique balance between the central and local governments. The central government is also intervening in the management data of local governments.

(2) United Kingdom

The Government Digital Service of the Cabinet Office handles digital government matters in the United Kingdom. The UK ranked 4th in the previous Waseda University Digital Government Ranking (2019/20). Two items, "portal site (homepage)" and "open government," were the main indicators responsible for the previous decline in scores. This is evidence that some digital measures in the UK are not progressing as expected. When evaluating the metrics comprehensively, the United Kingdom has made good progress over the past year.

(3) Singapore

The Waseda University team has organized many meetings with Singapore's digital government CIO, both CIO Khan and CIO Ho. CIO Ho has different stages at digital conferences all over the world. They have spoken about Singapore's digital government and discussed the role of government in smart nations. The Singaporean government has stated that "experience," "ecosystem," and "community" are important for building smart cities and smart nations.

For example, regarding tax payment business, there was an adverse effect from vertically divided administration. Tax filing was also difficult. However, at present, 92% of citizens declare by electronic service rather than the analog service. As a result, harmful effects were reduced, and the procedure became easier after digitalization. Regarding the transportation system, we researched the number of routes and stops between specific points during morning work commutes and calculated the optimum operation plan. By detecting deficiencies of drainage ditches in advance, it was possible to prevent the outbreak of mosquitoes in stagnant water and take measures to prevent dengue fever. It is important for the government to analyze how to deal with problems by foreseeing problems through these systems. It is difficult to start a business in a small country like Singapore. Therefore, the government office displays the issues every three months, and the small and medium-sized enterprises present solutions to them, match them, and create a cooperative relationship. High potential companies were presented with an example of an ecosystem that would allow the government to certify companies and participate in bids for public services. Singapore is a very strong country in terms of community, and in the event of an emergency, an app provides information that allows you to

immediately go to a rescue site and using these measures approximately 2000 people have been saved so far.

The biggest challenge in Singapore is the digital divide, and the government is developing education and enlightenment programs. They are working to make the digital ecosystem understandable for more people. The goal is to create a meaningful community by utilizing experience and ecosystem.

(4) Finland

Finland is one of the countries with the highest broadband penetration rates in Europe. Within the OECD, Finland was an early adopter of digital government initiatives. Based on international comparisons, impressive results have been achieved. Finland's digital government is cooperating with three ministries: the Ministry of Transport and Communications, the Ministry of Finance and the Ministry of Justice. The Ministry of Finance is responsible for central policymaking on administrative reform and the development of general ICT and digital government strategies. The public sector ICT, which is part of the province level government, is leading the overall development of the digital government. Finland has established the Ubiquitous Information Society Advisory Board, headed by the Minister of Transport and Communications, with the participation of representatives of major ministries, businesses and scholars to maximize cooperation between government agencies.

(5) Estonia

Estonia, which has always placed in the top 10 in the D-government world ranking, has 99% of its administrative services completed online, and the D-government bill that passed in 2014 makes it easy to apply regardless of nationality. It has become possible to open corporate and bank accounts without being an Estonian citizen. Since the 2000s, Estonia has digitized many administrative procedures such as resident registration and tax payment, and has become able to receive various services online 24 hours a day. With one national ID number, people can use it as a driver's license or health insurance card, and people can complete their tax return in just a few minutes. 95% of tax returns are completed online, and online voting exceeds 40% in the 2019 parliamentary elections. The current responsible agency is Digital Agency

(6) Australia

In July 2015, the Australian Government established the Digital Transformation Office (DTO) as an internal agency of the Ministry of Communications to promote the digitization of administrative services. In October 2016, the DTO was reorganized into the Cabinet Office and renamed to "DX Agency (Digital Transformation Agency (DTA)". DTA started the operation of an ID program called "myGovID" that can be used across various electronic administrative services in

October 2018. myGovID became available through the iOS app in June 2019, and as of the end of June 2019, 11,785 downloads and 6,676 IDs have been created. DTA is also promoting international cooperation, and in August 2019, it signed a memorandum of understanding with Vietnam aimed at cooperating in promoting D-government and digital transformation.

(7) South Korea

The Ministry of Interior and Safety is the agency responsible for digital government in the Republic of Korea. Usability-oriented systems have been launched, such as the installation of ATM-type digital service equipment in the city so that people can easily benefit from digital administration. They have been developing a common framework for public-private partnerships from an early stage, and are building a mechanism for local governments to use the system formulated by the central government. In addition, they are actively introducing advanced technology, taking security measures using AI and surveillance cameras, actively working on blockchain utilization in the trade and real estate fields, digital employee concept, personal authentication by biometrics, etc.

(8) Sweden

In Sweden, the Data Protection Agency plays an important role among government ministries. Much effort has been made by the Swedish government to promote digital government. These activities are found at both the central and local government levels. In October 2015, the Government established an Advisory Board for Digital Government. This committee is made up of high-level public sector decision makers whose mission is to advise on digital government policy. In addition, regular meetings and events were held at the municipal level to promote various aspects of digital government. These events gave Sweden a high score in the digital government promotion indicator of Waseda University World Digital Government Ranking Survey.

It is worth noting that any information is provided on national portals. This case shows that national information and available services should be included in the national portal as a one-stop gateway for residents and foreigners. Being a country with many well-known technology companies such as Ericsson, the government recommends using new technologies for public sector operations.

(9) China

In the Waseda University World Digital Government Ranking Survey, it is noteworthy that China is advancing the digitization of government with a sense of speed, although its ranking is not highly evaluated. The department of Industry and Telecommunications in the State Council is further deepening the "Internet Plus administrative services" -A plan to promote reform of administrative services. The "One Net, One Door, Once" was formulated in June 2018, and they aim to realize it as easily as possible.

By the end of 2019, they basically realized "one net, one door, once" for priority fields and frequently used items. For "One Net", the online procedure enablement rate for provincial-level administrative services shall be 90% or more, and the same ratio for city / prefectural-level administrative services shall be 70% or more. Regarding "One Door", except for items that have special requests for the location, it is basically possible to transfer to the general substantive administrative lobby, and for 70% or more of administrative services, "One window" reception will be realized. Regarding "Once", the reduction of materials required for window procedures by 60% or more and realize "Once" with 100 items that are frequently used in each level of provinces, cities, and prefectures. It is also characterized by the fact that it develops digital services by utilizing private technology on a city-by-city basis, and that the authority of local governments such as states and provinces is strong. In addition, the central government is not responsible for the reliability of data, but a mechanism is in place to share data managed by local governments with each other and with the central government.

In October 2019, in response to a request from the D-government officer of the Chinese State Council to learn about advanced cases of D-government from Japan, training was conducted at the Institute of D-Government at Waseda University. The Chinese was interested in the establishment of a mechanism in Japan's e-government, the division and determination of responsibilities, the institutional design, the general situation of laws and regulations, and the systematic arrangement and sharing of administrative office information systems. It also includes a model for constructing an administrative office information system, sharing of administrative office data, security by laws and systems, information security, and assessment / evaluation. In addition, regarding the status of online administrative services, the establishment model of the online administrative service platform, online processing of administrative services, online and offline fusion (OMO: Online Merges with Offline), citizen personal information data security, and technical realization. They are also interested in the status of all monitoring related to the market entity, such as environmental protection and safe production at this moment.

(10) Russia

The current government body for digital government is the Ministry of Digital Development, Communications and Mass media. Russia has promoted the Federal Information Society Plan 2011-2020. The first information society plan was implemented in 2000, and the D-government played a part in it. "E-Russia" was carried out from 2001 to 2010, but the results were unsatisfactory. The major problem is the delay in establishing legal rules. In addition, usability is not evaluated for inefficient infrastructure, and many other problems such as insufficient ICT skills of national government employees have piled up. In 2021, both the government and Moscow city are creating the Smart city concept for future city planning.

(11) United States

In the 2019/20 digital government ranking, the United States won the top spot for the first time in five years. A large budget has been prepared for science and technology with AI and its applications by GAFA and other super-IT companies. The common data of the main society called the "base registry" announced in 2019. Digitalization was placed as a pillar of this strategy. Since the United States is a large digital nation with Silicon Valley, the president takes the initiative in digital policy. In 1992, it was former President Bill Clinton who started the D-government, which was the first stage of the digital government. And in recent years, during the time of former President Obama, the active Federal Chief Information Officer (Federal CIO) was appointed to build an enterprise architecture (EA) to ensure interoperability and information sharing of federal systems, information security and privacy. They are developing data standards to improve the consistency and cross-reference of data management. The Biden administration has hired active CIO at the Presidential office for deployment of AI oriented DX.

(12) Canada

Canada ranked 4th in the world ranking 2021. Canada activates a digital ministry-centric policy. The Minister of Digital Service is responsible for overseeing digital government activities in Canada. The Minister for the government sector is responsible for managing and maintaining information technology and services throughout the government ministries of Canada. Canada is putting the priority of DX for government and private sectors

(13) Taiwan

In October 2019, the World Annual Meeting of the International Academy of CIO was held in Taiwan, and the Minister without Portfolio Audrey Tang, in charge of digital promotion, who suddenly became a "person of time" in measures against corona, made a speech. Minister Tan's role in digital world is "technology that is close to people." Minister Tan's idea is novel and colorful. This time, the technology that quickly helped ease Covid restrictions is "Civic Tech," which supports the digitization of government. In collaboration with a community organization that aims to solve social issues with ICT, they solve the issues by making full use of ICT from the standpoint of "citizens". Minster Tan said that the goal for digital is to be close to humans' lives and that many people should benefit from technology rather than forcing people who are not good at ICT.

(14) Germany

The national D-government strategy was formulated in September 2010. This aims to promote D-government by cooperating with federal, state, and local governments while utilizing ICT beyond the framework of organizations. In addition, in the "Digital Agenda" and "Digital Strategy

2025", the digitization of government has been positioned as one of the important policies. In Germany, the world's largest ICT trade fair "CeBIT" is held every year in Hanover. Recently, it seems that it has surrendered its position to another ICT fair, Mobile World Congress held in Barcelona, Spain. But, the venue of CeBIT is Hannover Messe, which is the largest exhibition space in the world. Since joining in 2012, the Waseda University team always has visited the "Urban Solutions" corner, which exhibition imitates the smartening of society that comprehensively captures big urban problems and digital communities issues and aims to integrate infrastructure and applications such as electronic local governments, disaster prevention, ITS, and cyber security. It was an exhibition where you can feel the true value of electronic local governments and smart digital cities policies in Germany.

(15) Thailand

In 2016, the name of the relevant agency was changed from the "Ministry of Information Technology and Communications" to the Ministry of Digital Economy and Society. The Ministry of Digital Economy and Society has a wide range of responsibilities for national information technology and communications, and after the name change to the Ministry of Digital Economy and Society, it will also work on planning and promotion in the digital economy and society. The Minister of Digital Economy and Society will be the head of the ministry. The Ministry of Digital Economy and Society of Thailand has drafted AI ethical guidelines. The purpose of creating the guidelines is to improve the competitiveness of Thailand based on the 20-year National Strategic Plan (2018-37).

On December 13, 2018, a seminar was held at Thammasat University on the theme of digital innovation co-sponsored by the Electronic Government Agency (EGA), the Faculty of Innovation, Thammasat University, and the International Academy of CIO. One of the speakers, EGA President Sack said: "Regarding the De-Government Project from 2016 to 2021, 80% of the current 400 government agencies will be digitized during the five years of the project period, and various registration and tax payment procedures can be done with a digital ID. The Digital ID was distributed in 2018. It was used initially in the financial field. A Digital ID can be used to open an account, and banks can check customers in the government database. The utilization of open data will also be started as part of the project. Also, Utilization of data analysis by AI for policies, plans, budgets has started. The goal is to promote paperless and cashless in 5 years and strengthen business competitiveness. EGA is considering the use of AI as the next step. In terms of legislation, the aim is to enforce digital government law in the near future, simplify data exchange between ministries, and increase transparency. Also, in 2018 DGA built the Government Secure Intranet to strengthen network security within the government. "

A year later, on January 30, 2019, President Sack of DGA at the Office of the Prime Minister's cabinet office shifted from EGA, MICT in Bangkok. DGA is promoting the digitization of administrative documents ahead of the enactment of the "Government Digital Act" in March 2019.

Currently, copying administrative service documents costs 1 billion baht per year, and 151 government agencies have already practiced the need to submit copies, providing information to citizens via mobile apps and business licenses via the web. That could be expected to reduce the budget by 3 billion baht. Digital national IDs and online real estate registration are also planned. Over the next three years, they aim to further promote paperless operations and move up to 20th place in the World Bank's business environment ranking. Blockchain technology will be used to exchange digital documents among government agencies. DGA plans to integrate these data and analyze them with AI, and set up an AI committee to formulate its strategy. Dr Supot introduced the new scheme for IoT-Big Data-A l- linkage for DX.

F. Highlights of 10 Major Global Issues

1. Digital Inclusion, Citizen centric and ID

◆ Advance digital ID

The spread of applications for digital national ID systems is a major trend in 2021. In Singapore, facial recognition technology was introduced to the national ID "Sing Pass" starting in 2021. The registered person's face enables recognition of administrative and banking procedures without using a traditional card. Sing-pass also supports digital signatures of legal documents.

In India, the penetration rate of the biometric national ID "Ardar" system reached 99% in June 2021. Ardar uses multi-path biometrics that combine fingerprint, iris, and facial recognition technology. Ardar uses equipment from NEC, a Japanese company, for biometric authentication. In Thailand, the Ministry of Digital Economy and Society, is working on planning and promotion in the digital economy and society and has drafted AI ethical guidelines. The purpose of creating the guidelines is to improve the competitiveness of Thailand based on the 20-year National Strategic Plan (2018-37).

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2. Privacy protection

◆ Amazon will be subject to maximum fines after EU GDPR enforcement

The EU currently has the strictest regulations on personal protection in the world. The General Data Protection Regulation (GDPR) came into effect in 2018. Personal information protection laws that follow the GDPR are being developed and discussed in various countries around the world. In recent months, two important sanctions have been imposed on US companies.

In July, Amazon was fined € 746 million by the Luxembourg data protection authorities for violating the General Data Protection Regulation (GDPR). Amazon's European headquarters are located in Luxembourg. This is the highest GDPR fine to date as of 2021. The highest amount prior to this was a € 50 million fine imposed on Google by French data protection authorities in December 2019.

Amazon suggests a policy challenge. Amazon may have violated privacy regulations for consumers who use online shopping. Second, it is possible that the Amazon’s products were given preferential treatment over outside vendors that sell on the marketplace.

WhatsApp is famous for its messaging app, but in September 2020 the Irish Data Protection Commission (DPC) decided to impose a fine of € 225 million for violating the GDPR. DPC found WhatsApp violated GDPR by not properly informing users how WhatsApp shares personal information with its parent company Facebook. WhatsApp suggests a policy to file a complaint.

Under the GDPR, data protection authorities can impose fines up to 4% of global annual sales for companies that mishandle data. The fine on Amazon is equivalent to 0.2% of Amazon's 2020 sales.

◆ World movement

In the United States, although federal-level regulation is sluggish, state-level regulation is moving forward in some Democratic states. There are moves to strengthen privacy protection in New York, where large companies are gathered, and in Washington State, where Microsoft and Amazon are headquartered. Among those states that have adopted privacy legislation, the state that first enforced the privacy protection law is California. The California Consumer Privacy Act (CCPA) came into force in January 2020, and the amendment was passed in November 2020. The California Privacy Rights

Act (CPRA) will come into force in January 2023.

In Japan as well, a bill to amend the Personal Information Protection Law was passed during the 2020 ordinary Diet session. The Personal Information Protection Law is less strict than either the GDPR or CCPA.

In China, the Personal Information Protection Bill was passed in August 2021. The Personal Information Protection Law will come into effect in November 2021. When a company collects personal information, the law requires that in order to obtain biometric information, medical data, financial accounts, location information, etc. a company must obtain the individual's explicit consent. This law restricts the transfer of information abroad. Therefore, when foreign companies handle personal information of Chinese citizens, it is necessary to comply with new regulations. The new law requires representatives to be assigned within China to report information gathering to regulators.

The new legislation in China has three purposes. First, the government protects consumers by tightening regulations on businesses. Consumers can now turn off targeted advertising themselves. Strengthening supervision is a recent trend in China. In August, the city of Beijing filed a lawsuit against Tencent over gathering information on the WeChat app.

Second, it appeals to the world that the Chinese government is active in protecting personal information. There has long been suspicion that Chinese apps are fraudulently stealing personal information. The Chinese government's enforcement of strict personal information protection laws will increase the reliability of Chinese-made apps.

Third, China can take advantage of new regulations to foster domestic high-tech companies. It will be possible to overlook Chinese companies and crack down on foreign companies.

In Southeast Asia, Singapore enacted the revised Personal Information Protection Law in 2020. In Malaysia, the Personal Information Protection Law enacted in 2010 complies with the GDPR. In Thailand, the Personal Information Protection Law is scheduled to be fully enforced from June 2022. A personal information protection bill is under deliberation in Indonesia. No legislation has been put in place in Vietnam, but a government ordinance is scheduled to come into effect in December 2021.

3. Silver Innovation ICT / Digital Contribution to Improve Ageing Society

◆ Usage status of information and communication equipment for the elderly

The 2021 White Paper on Aging Society in Japan published the "International Comparative Survey on the Life and Awareness of the Elderly". The survey clarified usage status of information and communication equipment by the elderly. The usage rate of smartphones, tablets and PCs by the elderly in Japan is much lower than in the United States, Germany and Sweden. 14.9% of the elderly in Japan use personal computer e-mail, which is lower than in other countries. In addition, the online banking and government procedures utilization rate of elderly people in Japan is less than 10%. This

is compared to the 70% rate in Sweden for elderly use of online banking. One in three seniors in the United States and Sweden use online national and government procedures.

Regarding the reasons for not using information and communication equipment, many elderly people in each country answered, "I don't know how to use it, so it's troublesome" and "I don't feel the need." In Japan, the number of people who answered "I don't feel the need" decreased from 70.4% to 49.2%, and the number of people who answered "I don't know how to use it, so it's troublesome" increased from 26.8% to 50.3% compared to the survey five years ago.

Elderly people in Japan are feeling the need for information and communication equipment more than before. However, many don't know how to use it, and therefore think it's troublesome. Operating smartphones and personal computers can be a major hurdle for the elderly. Going forward, it is important to increase the IT literacy of the elderly.

Information and communication equipment that elderly people usually use
(multiple answers)

	Japan	U.S.	Germany	Sweden
TV	80.20%	80.70%	92.00%	79.90%
Smartphone	44.50%	62.60%	65.20%	58.80%
Tablet	10.60%	40.40%	27.70%	43.30%
PCs	31.10%	62.90%	43.90%	53.00%

2021 White Paper on Aging Society

From December 2020 to January 2021, a survey was conducted on men and women over the age of 60 (1,367 in Japan, 1,006 in the United States, 1,043 in Germany, and 1,528 in Sweden).

Details of use of information and communication equipment (multiple answers)

	Japan	U.S.	Germany	Sweden
Contact us via computer e-mail	14.90%	63.40%	41.20%	49.60%
Collecting information and shopping on the Internet	31.70%	64.30%	56.90%	67.90%
Net banking and financial transactions	7.70%	47.60%	33.10%	72.40%
Internet-like national and administrative procedures	6.70%	34.40%	19.40%	34.50%

2021 White Paper on Aging Society (Japan)

◆ ICT services for the elderly

Services that exist to connect the elderly and ICT include services in which the main target is a senior who lives with a family member or a long-term care provider, and services in which the main target is the elderly. Examples of the former are watching services and nursing care robots that

use ICT equipment. Examples of the latter include home-based telemedicine services, online supermarkets, and meal delivery.

The Japanese government will promote DX support for long-term care providers. Long-term care providers who have introduced ICT equipment are given preferential treatment with long-term care fees. Examples of ICT equipment are watching equipment, income, and long-term care recording software. Although deregulation was carried out in 2021, the introduction is not progressing much because the system still requires strict operating conditions. More thorough deregulation is expected to promote Silver DX.

◆ Measures for the elderly in China

In China, as a measure for the elderly, consideration will be given to people who cannot use digital devices and smartphone use will be promoted. For Cashless payments, which are widespread in China, the Chinese government requires retailers to also accept cash payments. This considers people who cannot use smartphones.

A volunteer system will be established for teaching how to use smart devices to the elderly. Manned counters and telephone reservations are maintained at tourist destinations and exhibition facilities. Face-to-face and cash payments are maintained in housekeeping and long-term care services.

As a measure to promote digital devices, the Ministry of Industry and Information Technology instructed application developers to develop designs that are easy for the elderly to use and versions for the elderly in November 2020. It covers 43 apps and 115 sites. In addition, some public facilities, including public toilets, require users to present a QR code that indicates their health status. There was created a digital divide because those without smartphones could not use the facilities. Currently, public facilities have also begun to accommodate people who do not have smartphones.

At the National People's Congress in March 2021, Prime Minister Li Keqiang addressed that smart devices should not interfere with the daily lives of the elderly. The Internet usage rate of middle-aged and older people in China is lower than that of Japan. Measures for the elderly will become more important over time.

4. Booming environment-friendly smart digital city construction

◆ New Boom for Smart city in Japan

In Japan, one of the local governments aiming for a super city is "Smart City AiCT" in Aizuwakamatsu City. AiCT has 36 companies in the office. The office, which opened in April 2019, was fully booked in September 2021. Accenture, which has previously conducted a project with Aizuwakamatsu City, will play a central role. Aizuwakamatsu City will develop various citizen services by utilizing the urban OS developed by Accenture. Aizuwakamatsu City has adopted an opt-in method in which data is provided only to the citizens who agree. Aizuwakamatsu City positions

healthcare as a priority field and promotes shortening of hospital stay time and extension of healthy life expectancy. The entire region is regarded as a virtual institution responsible for health management, medical care, and long-term care. The facility will have latest digital technologies such as health management / status monitoring, AI family doctors, and AI hospitals will be utilized.

◆ Smart city development progresses in ASEAN and other Asian countries

In ASEAN, the ASEAN Smart City Network was launched in 2018. Select cities from member countries and focus on smart cities. In Vietnam, Hanoi, Ho Chi Minh and Da Nang were chosen. Vinhomes, a subsidiary of Vingroup, the largest conglomerate in the country, is developing smart cities in Hanoi and Ho Chi Minh City. A camera with a face recognition function equipped with AI will be installed in the area. An intelligent disaster prevention system and an air pollution environment pollution warning system will be installed. In connection with the development of smart cities in Southeast Asia, Japan, China, and South Korea will each sign a memorandum of understanding with ASEAN to promote their own smart city technology.

The Smart city project implementation countries are India, Uganda, Cambodia, Thailand, Vietnam and Mauritius. For example, Vietnam will introduce a water quality information provision app, and Thailand will verify the feasibility of utilizing AI technology in tap water channel management. Mauritius will use the urban operating system developed by Accenture to centrally manage multidimensional data on disasters. By combining various data acquired for disaster prevention purposes with urban infrastructure data, it is possible to formulate disaster prevention plans more efficiently.

Based on the US-ASEAN Smart City Partnership, the United States will promote the involvement of the US private sector and support research and development. In August 2021, US Vice President Harris visited Singapore and published her fact sheet. In the section on expanding collaboration in smart cities, it was stated that a green building program would be established to promote green building standards. In the field of cyber security, the Ministry of Finance, the Ministry of Defense, and the Cyber Security Department of both countries have signed a memorandum of understanding for bilateral cooperation.

◆ Challenges of smart cities

Here are two issues for smart city development. First, it is important for residents to reach consensus. Since smart cities use a large amount of data about residents, residents of smart cities need to provide various personal information. When a new smart city is built, it is possible to move in residents who have agreed in advance. On the other hand, when an existing city becomes a smart city, residents who are positive about providing personal information and residents who are cautious about providing personal information coexist in that city. Residents' understanding of the provision of

personal information is essential for the promotion of smart cities.

Third, we must aim for smart city development that can achieve the SDGs. Development that promotes global warming and environmental destruction should not be allowed in return for new urban development. Placing a lot of foliage is not just environmentally friendly. Analysis and evaluation based on strict environmental standards are required at the construction, maintenance, and demolition stages of smart cities.

5. 5th Generation Digital Government- A new e-government that makes full use of 5G

According to Ericsson's announcement, the number of 5G subscription contracts worldwide for 5G compatible devices increased by 70 million in the first quarter of 2021, reaching about 290 million. The number of contracts will increase to 580 million by the end of 2021 and is expected to reach 1 billion by the end of 2022. 5G is gaining widespread adoption at a faster pace than 4G. 5G population coverage is projected to reach 25% in 2021 and reach 60% in 2026. However, population coverage does not mean that one can always connect with 5G within a 5G area. It is highly likely that the mainstream connection method in the first half of the 2020s will be 4G. Considering the prediction that 6G will be put into practical use around 2030 and will not spread worldwide, 5G will become the mainstream connection method from the latter half of the 2020s to the 2030s.

◆ 5G development in Asia

In some Asian nations, the government is deeply involved in 5G strategies.

In Vietnam, the military-affiliated telecommunications company Viettel has developed 5G telecommunications equipment. Four major domestic companies share Viettel’s 5G equipment. Viettel provided Vietnam's first 5G communication service in December 2020. Domestic production of 5G equipment is important in national security. In addition, Viettel is eager to export 5G equipment.

China aims for the rapid spread of 5G networks. According to the announcement by the Chinese government, as of the end of March 2021, the number of 5G base stations in China was 891,000, accounting for 70% of the world total. By 2025, China's 5G-related investment is projected to reach around 1.2 trillion yuan, and IT-related consumption is projected to reach 8 trillion yuan.

Malaysia made a major shift in its 5G policy in 2021. In the past, domestic telecommunications companies were planning to develop their own 5G networks. However, due to the government's policy change, each telecommunications company will share the 5G network built by the government. The Malaysian government announced a contract with Ericsson in July 2021. Building a 5G network led by the government is a method like that used in Vietnam. This policy change has two major implications. First, telecommunications companies can reduce the cost of investing in 5G infrastructure, allowing consumers to use 5G at a lower rate. The second is to curb

China's influence on 5G networks. Malaysia's four major mobile companies had contracts with Huawei and ZTE for 5G infrastructure development. There are considerable efforts to keep Chinese companies out of the 5G network in Europe and the United States. The United States is pressing countries around the world to eliminate connections to Chinese companies. Among them, it was a security risk that 5 G infrastructure was mostly made by Chinese companies.

Currently, there are few options for 5G communication equipment manufacturers. By developing technology that combines products from multiple companies, telecommunications companies can disperse various risks.

6. Spread of new technologies-blockchain and quantum computers

◆ Blockchain

Investment in blockchain technology is increasing in China, the United States, and the EU. The Chinese government will promote policies with the aim of making the blockchain industry part of the world's top industries by 2025. In June 2021, the Ministry of Industry and Information Technology (MIIT) announced a roadmap for the spread of blockchain. By 2025, the Chinese government will develop three to five internationally competitive companies and innovation leaders. Blockchain clusters are formed by these companies. In 2030, the technology will be further improved, and the scale of the industry will be expanded. Blockchain technology will strengthen manufacturing and support the digital economy. In order to strengthen the blockchain industry, it is important to strengthen the real economy through "supply chain management," "product traceability," and "data sharing." Blockchain technology will be used for applications in smart cities and for building data sharing platforms for government services.

In the United States, major financial institutions such as Morgan, Citi, Wells Fargo, and US Bancorp use blockchain technology. Other financial institutions will also consider cryptocurrency transactions. According to a survey by a major bank, Bank of America, 21% of banks have somehow incorporated blockchain technology into their operations. Many politicians and experts point out that legislation is inadequate for virtual currency transactions, which are typical financial transactions using blockchain technology. Democratic Senator Elizabeth Warren says investors face risks in the uncertain crypto market. She argues that the US Securities and Exchange Commission (SEC) should strengthen its authority.

In the EU, "INATBATA", an international standardization organization for blockchain, was launched in 2019. INATBATA aims to provide a global forum for blockchain developers and users to further promote the social application of blockchain.

In addition, the blockchain technical support project "TruBlo" will be held under the initiative of the European Commission, the Next Generation Internet (NGI). To promote blockchain technology research, TruBlo will provide partial and full funding for selected projects for three years

from 2021. From 2021 to 2022, the EU will invest € 62 million to support top Internet innovators in the areas of Internet trust and data sovereignty. These policies are based on the EU R & D support framework "Horizon Europe" adopted in 2020. It will invest 80.9 billion euros in the seven years from 2021 to 2027. Support projects will be implemented in fields such as AI / robotics, next-generation Internet, quantum computers, and big data.

◆ Quantum computer

Regarding quantum computers, the United States, EU, and China will take the lead in supporting research and development. The US will spend up to $ 1.3 billion over the five years from 2019. The EU will spend about 1 billion euros in 10 years from 2018. China will implement a research plan of about 7 billion yuan over five years from 2016.

Japan formulated a quantum technology innovation strategy in January 2020. It will spend 55 billion yen in two years from 2020. The strategy proposed the formation of a quantum technology innovation hub (international hub) and the establishment of a council on quantum technology. In line with this strategy, the "New Industry Creation Council by Quantum Technology (Q-STAR)" was established in September 2021 with the participation of 24 companies including Toyota, Toshiba, and NEC.

7. How D-Government Will Change with Covid and Post-Covid

◆ The role of D-government in the Covid-19 disaster

With reference to the case of Japan, there are two points about the role of D-government in the corona disaster.

First, various support systems will go online. The economy was severely damaged by lockdowns in other countries, requests for temporary closure of Japanese companies, and requests for citizens to refrain from going out. Therefore, various support systems such as subsidies, benefits, and interest-free loan services have been expanded. Online procedures are essential for the efficient operation of the support system. Unfortunately, Japan has failed to bring such benefit procedures online. The data sent was incompatible with the databases, requiring staff to re-enter the data. Some municipalities have requested mailing procedures instead of online procedures. This is because the mailing process is ended up being faster than the online procedure. The system must be redesigned for more efficient online procedures. This is a national level policy, not a municipal level.

Second, new innovations have been created to combat Covid-19. Corona-infected person tracking apps have been developed around the world. Gov-Tech is expected to grow in the market. It will be the role of the government to foster Gov-Tech companies and sell them overseas.

◆ **With Corona**

In Europe and the United States, the movement to regain daily life is becoming active. The United Kingdom implemented a complete deregulation on July 19, 2021. By September 2021, the number of infected people has not increased sharply, but it tends to increase slightly. As of August 13, 76% of the population had completed the second vaccination. However, the average number of infected people per day is 30,000 and the average number of deaths is 100, which is a number that cannot be optimistic. Nevertheless, the British government has indicated that it will proceed with its reopening policies.

The number of infected people in the United States shows a clear upward trend. In early September, the average number of infected people was 150,000 per day, and the average number of deaths was 1,500 per day. There are 90 million unvaccinated people in the United States. To combat this, vaccination or proof of testing are emphasized. New York City regulations from August 16, 2021 require users and employees to certify vaccination when entering indoor restaurants, fitness gyms, and indoor recreational facilities. Vaccination proof is also required for classical concerts with a quiet audience. Proof methods include New York City's Coronavirus Safety App, Excelsior Pass (New York City's electronic proof), and a CBC-issued vaccine card.

8. Relationship between global warming, climate change and disasters and government measures

◆ **Disaster prevention DX**

In the disaster prevention DX, there is an effort to convert the management of stored food to DX. Most of the emergency food stockpiled by the local government is hard food that can be stored for a long time, such as hard bread and biscuits. Such foods are difficult for the vulnerable infants and the elderly to eat.

In the future, by sharing various data such as the place where residents live, the distance of evacuation shelters, and road conditions with other local governments, Yoichi Town will be evacuated to the safest evacuation shelter regardless of the boundaries of the city. The aim is to create a mechanism by which this can be done. The introduction of a stockpiled food management system and the accommodation of evacuation shelters and food between local governments are important components of the disaster prevention DX efforts.

9. DX (Digital Transformation) The actual situation of digital transformation

◆ **Digitization of regional economy**

There is a trend of "digital regionalism" that connects the local economy and digitalization. A community-based platform has been created to meet the demand for local production for local

consumption. One of the reasons is that the corona restrictions made it difficult to go out, and there was a demand to support local shops and businesses. For example, in Quebec, Canada, there are e-commerce sites that handle local products, as well as carpooling services, bartering, and apps that support local projects.

◆ Educational DX

DX in education has made great progress due to the corona virus. Online classes are offered in China, the United States, and other countries around the world.

In Japan, universities and private schools started online classes in 2020. In public schools, many municipal schools that have declared a state of emergency and will offer real-time online lessons to students who are worried about attending school from the second semester of 2021. Many public schools were unable to prepare real-time online lessons during the school closure last spring due to problems with the communication environment and terminals. Instead, the school distributed lesson videos taken by teachers to video sites and school board servers.

◆ Inauguration of the Digital Agency of Japan

In Japan, the Digital Agency was established on September 1st, 2021. The Digital Agency has about 600 employees, 200 of whom were hired from the private sector. Regarding the establishment of the Digital Agency, the appointment of engineers at the forefront of technology was emphasized. Some workers continue to work part-time in the private sector or part-time at the Digital Agency. The Digital Agency referred to Singapore's Gov-Tech, the UK's Cabinet Office Digital Service (GDS), and the Danish Digital Agency for inspiration.

The Digital Agency has set the goal of "realizing a digital society where no one is left behind." This is similar to the idea of UN SDGs. There is a strong need to help men and women of all ages benefit from DX and access digital content.

10. United Nations SDGs and the role of the government

◆ SDGs and ICT

The goals set out in the SDGs are compatible with ICT. For example, in order to solve food shortages, it is necessary to improve efficiency and productivity through agriculture using ICT. One of the support mechanisms is to provide medical opportunities using a telemedicine system for the spread of medical care. An advanced disaster prevention system using AI and IoT should be built to respond to natural disasters. In addition to reducing the burden of housework on women, one of the solutions is build or upgrade to smart homes through the spread of AI and IoT appliances. It is important for the government to support the implementation of various projects that combine SDGs and ICT both at home and abroad. Ten fields are envisioned as to complete the project. Infrastructure,

agriculture and food, medical care, education, urban areas, basic living, finance, disaster prevention environment, tourist exchange, and finally freedom from gender barriers.

In Japan, "Society 5.0" was proposed in the government's 5th Science and Technology Basic Plan. Society5.0 is defined as a human-centric society that achieves both economic development and resolution of social issues through a system that highly integrates cyberspace and physical space. Society 5.0 is positioned as a new form of society following the hunting society (Society 1.0), agricultural society (Society 2.0), industrial society (Society 3.0), and information society (Society 4.0).

F. Methodology

For evaluating digital government development, this ranking survey is based on a group of indicators to evaluate the overall digital government development in a country, ranging from policy development and e-Services implementation to management optimization and digital government promotion. To improve the evaluation of digital government development in a country, from 2010, the ranking added an e-participation indicator. In 2014, Open Government Data and Cybersecurity were also added to the ranking. In the 2017 Ranking, the research team added "the usage of emerging ICT technologies". It comprises a total of ten main indicators for evaluation.

Increasing the quality, the assessment used a questionnaire as a tool to obtain some information from respondents who reside in the countries. The respondents are government officers who work for a ministry that concerns digital government and, to some extent, respondents from academia who are knowledgeable in digital government. The questionnaire in the upcoming ranking is mandatory. The score will use the feedback as additional information to mitigate the sample risk, thus, reducing bias during scoring. The following explanation shows the due process that went into creating the ranking.

Waseda International Digital Government Ranking is also based on clustering methods by classifying countries according to the group, which has been demonstrated by organizations (APEC, OECD), by the size of population and GDP, by regions (Asia-Pacific, Americas, European, Africa, Middle East, and CIS countries

Formulation

The Raw Score is normalized to the 0-100 scale score using the following formula.

$$NormScore = \frac{RawScore}{MaxScore} \times 100$$

The raw score is the Score generated by averaging Score 0 and Score 1; MaxScore is the maximum score of the sub-indicators.

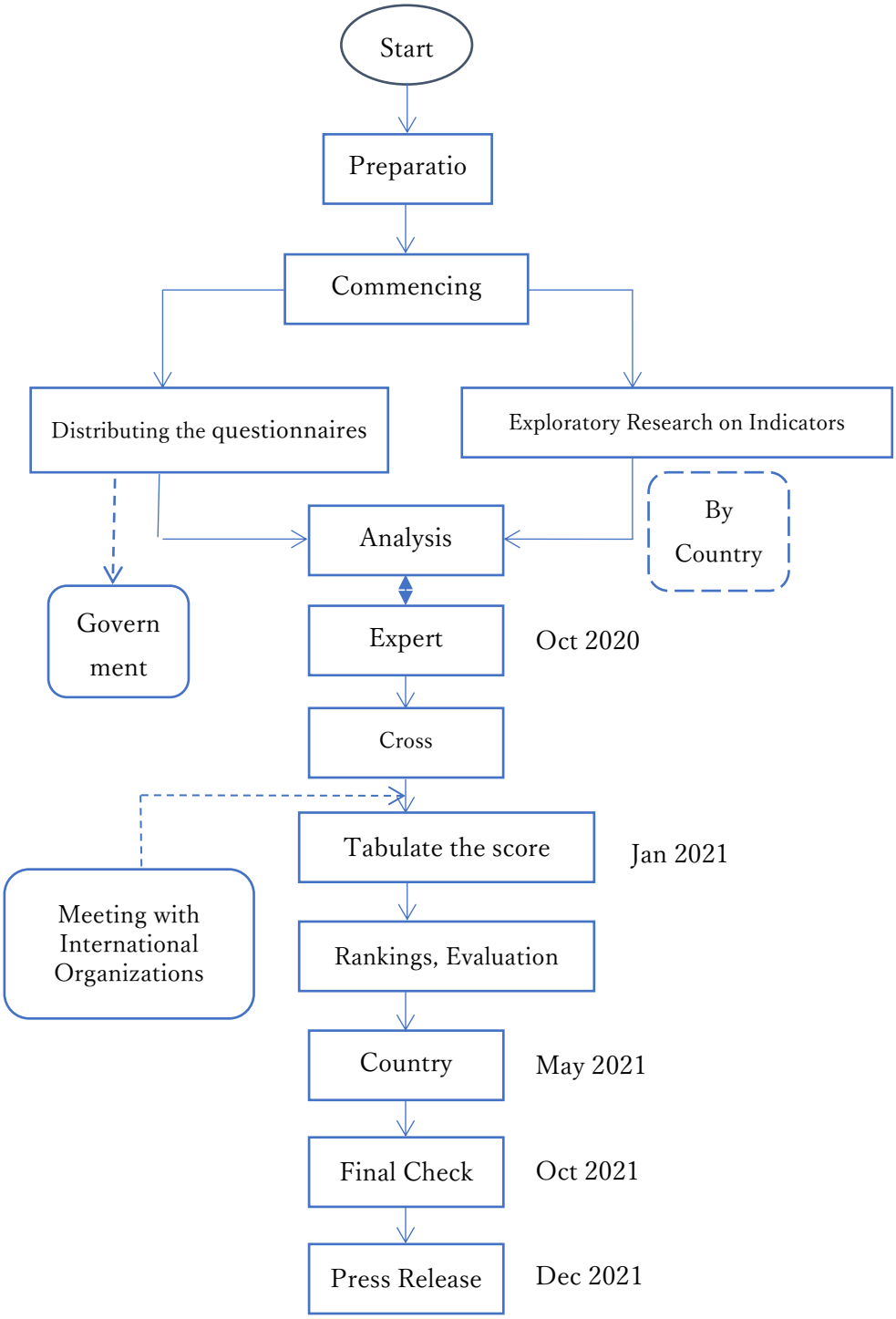
This will generate the Normalized Score which ranges 0 – 100. Furthermore, the Normalized Score is recalculated by the weighted rate. The result is the released score that will be used as the source for arranging the rank.

No	Indicators	2019/20
1	**Network Infrastructure Preparedness (NIP)**	**NormScore x 10%**
2	**Management Optimization (MO)**	**NormScore x 12%**
3	**Online Services (OS)**	**NormScore x 12%**
4	**National Portal (NPR)**	**NormScore x 8%**

5	**Government Chief Information Officer (GCIO)**	**NormScore x 10%**
6	**Digital government Promotion (EPRO)**	**NormScore x 10%**
7	**E-Participation (EPAR)**	**NormScore x 10%**
8	**Open Government Data (OGD)**	**NormScore x 10%**
9	**Cybersecurity (CYB)**	**NormScore x 10%**
10	**The emerging technology in Digital government (EMG)**	**Normcore x 8%**

G. Processes of Evaluation

The following process prepares the rankings



H. Contributors List

@ Contributors (• indicates a group leader)List of Global Experts Group

International Experts

- Prof. Dr. Toshio Obi, Chairman, Institute of Digital government, Waseda University, Japan, Honorary President, International Academy of CIO, Director of APEC Digital Government Research Center.
- Prof. Dr. J.P Auffret, Chair, MOT/CIO Program of George Mason University, President of International Academy of CIO.
- Prof. Dr. Luca Buccoliero, Marketing Department Bocconi University, Italy.
- Prof. Dr. Suhono Harso Supangkat, Bandung Institute of Technology, Indonesia.
- Prof. Dr. Francisco Magno, Director, Institute of Governance De La Salle University, Philippines.
- Prof. Fang Chun Yang, Dean, Academy of Digital Government, Peking University, China.
- Vice Rector/Associate Prof. Dr. Jirapon Sunkpho, Thammasat University, Thailand.
- Professor Dr. Atreyi Kankanhalli National University of Singapore,Singapore
- Prof. Dr. Alexander Ryzhov, The Russian Presidential Academy of National Economy and Public Administration (RANEPA), Russia.
- Prof. Dr. Tomi Dahlberg, Information System, University of Turku, Finland.
- Prof. Hsin-Chung Liao,Deputy Director, Taiwan e-Government Research Center,

List of Professors and Experts at Institute of Digital Government, Waseda University

● Prof. Dr. Naoko Iwasaki, Waseda University	-Prof. Dr. Yoshio Tozawa, University of Industrial and Science
- Prof. Dr. Tatsuyuki Negoro, Waseda University	- Prof. Dr. Kuroda Waseda University
- Prof. Dr. Atsushi Kato, Waseda University	- Prof. Dr. Nakajima, Waseda University
Prof. Dr. Hiroko Kudo, Chuo University	

List of Researchers and RA, staff at Institute of Digital Government, Waseda University

Researchers: and Research Assistant/Staff

● Dr. Nguyen Manh Hien	- Dr. Yao Yang
- Dr. Pingky Dezar Zulkarnain	- Dr. Bandaxay Lovanxay
- Dr. Nguyen Ngoc Anh	- Mr. Eiji Yamada,
- Dr. Diana Ishmatova Mizukoshi,	- Dr. Pingky Dezar
- Mr. Erich Josef Schwartz	- Mrs. Kazumi Mishima
- Ms Tomoe Nakagawa	

■This report is available from the official website of the Institute.

URL: https://idg-waseda.jp/ranking.htm

■Inquiries

Institute of D-Government Waseda University: Dr. Iwasaki, Ms. Nakagawa

1-21-1 Nishiwaseda, Shinjuku-ku, Tokyo, Waseda Nishiwaseda Bldg19. No.321

obi_waseda@yahoo.co.jp