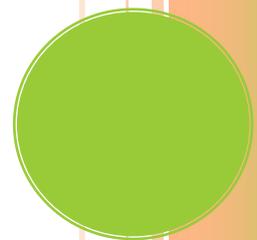


# THE 13TH WASEDA – IAC INTERNATIONAL DIGITAL GOVERNMENT RANKINGS 2017 REPORT

*August 2017, Tokyo, Japan*

The Institute of Digital Government at Waseda University, Tokyo in cooperation with the International Academy of CIO (IAC) has released the results of its 13th International Digital Government rankings survey for 2017.



# Executive Summary

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August 3, 2017

The Institute of Digital Government, Waseda University headed by Prof. Dr. Toshio Obi, has released the results of 2017 Waseda-IAC International Digital Government rankings survey for the 13th consecutive years. This survey is conducted by the distinguished experts from Waseda University and 10 world class universities under International Academy of CIO in the field. Thanks for their contributions to the multi-stages of the survey. One of clear change of our survey this year is to recognize the transformation from [e-Government] to [Digital government] as the new definition which covers more comprehensive activities. Both Digital Innovation and Digital Economy are the key for economic growth and challenges.

The 2017 ranking survey marks Singapore staying at first place, followed by Denmark in 2nd, USA in 3rd, Japan in 4th, Estonia in 5th, Canada in 6th, New Zealand in 7th, South Korea in 8th, UK in 9th, and Taiwan ranked 10th.

In the context of continuing ICT development, especially the rising of AI, IoT and Cloud Computing last year, the development of technologies has some impact on Digital Government in 2017. Although there are lots of fluctuations in the usage of AI, it has not yet made much impact on the activities of the government. Few countries have adopted both AI and IoT to improve the quality of service, most of which are concentrated in developed countries such as USA and Denmark.

In the middle of overall ranking, there are four countries which increased their rank compares to the ranking last year. For example, Macau jumped to the 28th compared to the 32nd. Philippines jumped 5 steps from the 38th place to the 33rd place in the 2017 ranking. UAE also has a high position (34th) compared to the ranking last year (40th). The 2017 ranking marked both Turkey and China improved their positions. However, the 2017 ranking also marked some countries lost the position such as Malaysia and Chile in comparison with last year's.

The process of D-Government ranking in 2017 is evaluating by 10 main indicators and 35 sub-indicators. In addition, we keep a number of countries for evaluation target is 65 countries, same as in 2016. The 2017 rankings are summarized based on a combination of Waseda and IAC (International Academy of CIO), during one year survey, and we prepare the relevant reports from many international conferences and meetings with institutions organized such

as APEC, ITU and OECD, as well as receiving the comments from experts of IAC member universities.

This report contains Chapter II[Ranking by indicators and Sector Analysis] with 10 indicators, Chapter III and V as rankings by organizations, size of population and GDP and Regions, and Chapter VI [New trends and 5 Highlights], Chapter VII for Methodology. The last chapter in this report shows a contribution list.

The 2017 rankings also point to major trends in the usage of ICT in government activities. The report shows that there are some new trends and they continue to grow strongly in the coming years. An analysis for thirteen years of the Waseda – IAC D-Government Rankings Survey indicates the following five highlights of the new trends: these are (1) Mobile Government, (2) AI and IoT for Digital Government, (3) Smart City, (4) Cloud Computing Technology and Digital Government, (5) ICT for Anti-Corruption.

In addition to the above highlights, there will be five challenges in D-Government to be solved. There are “Digital Innovation – Cloud, IoT, AI applications”, “Ageing Society”, “Globalization”, “Digital Divide for global and local communities”, “Urbanization with Smart city-harmonization and Cooperation between Central and Local governments”

For the details of a full ranking report on 2017 Rankings with all 65 Country Reports, please access to the IAC homepage (<http://academy-cio.org/>) or contact with Institute of Digital Government, Waseda University, Tokyo, Japan.

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## I. 2017 Overall Ranking

The main indicators in the 2017 rankings remain the same as in 2016, with 10 indicators and 35 sub-indicators. The methodology and scores of indicators are still assessed by following the same approach of 2016. The processes of evaluation are reviewed through 3 steps: web search, a questionnaire to the government officers and last review by IAC experts.

No	Total Rankings	Score	No	Total Rankings	Score	No	Total Rankings	Score
1	Singapore	91.057	23	Switzerland	63.788	45	Kazakhstan	52.476
2	Denmark	88.739	24	Hong Kong	63.695	46	Saudi Arabia	51.006
3	USA	87.117	25	Israel	62.949	47	Vietnam	50.540
4	Japan	81.236	26	Portugal	62.721	48	Brazil	50.475
5	Estonia	81.198	27	Italy	62.707	49	South Africa	50.417
6	Canada	77.425	28	Macau	61.145	50	Brunei	49.791
7	New Zealand	75.041	29	Czech Republic	60.998	51	Georgia	49.592
8	South Korea	74.828	30	Spain	58.804	52	Lithuania	46.956
9	UK	74.214	31	Russia	58.449	53	Argentina	45.776
10	Taiwan	73.224	32	Indonesia	58.032	54	Peru	45.702
11	Austria	70.929	33	Philippines	57.346	55	Uruguay	44.847
12	Sweden	70.234	34	UAE	57.295	56	Morocco	43.787
13	Australia	68.396	35	India	57.071	57	Colombia	43.099
14	Iceland	68.077	36	Malaysia	56.386	58	Tunisia	42.986
15	Germany	67.212	37	Poland	56.317	59	Pakistan	40.621
16	Norway	66.861	38	Romania	55.947	60	Venezuela	38.946
17	Netherlands	66.783	39	Turkey	55.527	61	Kenya	38.705
18	Finland	66.772	40	Chile	53.610	62	Egypt	37.735
19	France	65.911	41	Bahrain	53.480	63	Nigeria	37.443
20	Ireland	65.834	42	Mexico	53.441	64	Costa Rica	34.200
21	Thailand	65.200	43	Oman	53.426	65	Fiji	33.897
22	Belgium	65.189	44	China	52.865			

**Table 1: Waseda – IAC D-Government Total Ranking 2017**

The results of the 2017 rankings are shown in Table 1. The results show that Singapore remains in the first place and a leading country in applying IT into state administration and management. The 2017 rankings mark Singapore in the first place. Singapore has been very successful in applying IT to government operations. In 2017, Singapore has deployed AI (Artificial Intelligence), the latest trend of IT in public administration.

In 2017 rankings, Denmark has replaced the USA in the second position. Denmark has also been a pioneer in the application of new ICT technologies in the state

administration. The USA dropped to the third position in the 2017 ranking compared to the second last year. 2017 marked big political changes in ICT application in the USA.

Rank 2017	Country	NIP	MO	OS	NPR	GCIO	EPRO	EPAR	OGD	CYB	EMG	TOTAL
1	Singapore	6.953	11.200	11.640	7.400	8.636	9.677	9.500	9.500	9.800	6.750	91.057
2	Denmark	7.960	12.000	11.640	7.852	7.273	8.065	8.500	9.250	9.200	7.000	88.739
3	USA	6.870	10.400	10.800	7.407	9.091	8.548	9.250	9.250	9.000	6.500	87.117
4	Japan	7.460	12.000	10.530	4.800	9.091	9.355	7.500	9.000	8.000	3.500	81.236
5	Estonia	7.053	12.000	10.974	5.547	7.727	7.097	9.000	8.500	8.800	4.500	81.198
6	Canada	6.040	11.200	9.606	6.800	7.727	6.452	9.000	10.000	7.600	3.000	77.425
7	New Zealand	6.957	11.500	9.954	5.387	7.727	4.516	6.000	10.000	10.000	3.000	75.041
8	South Korea	6.777	9.600	9.606	6.985	6.818	7.742	7.500	9.000	8.800	2.000	74.828
9	UK	7.250	11.200	9.573	5.107	5.000	5.484	8.500	9.000	9.600	3.500	74.214
10	Taiwan	5.376	9.600	9.132	5.620	7.727	7.419	7.750	9.000	7.600	4.000	73.224
11	Austria	6.037	9.600	10.404	6.173	6.364	6.452	7.000	8.500	8.400	2.000	70.929
12	Sweden	7.617	10.400	10.596	5.333	3.636	6.452	8.500	8.000	7.200	2.500	70.234
13	Australia	7.083	6.400	10.920	7.333	7.273	8.387	6.000	4.500	6.000	4.500	68.396
14	Iceland	7.620	11.200	11.280	7.111	7.273	4.194	5.750	6.250	5.400	2.000	68.077
15	Germany	6.187	11.400	10.146	2.667	5.909	3.503	7.000	9.000	6.400	5.000	67.212
16	Norway	7.557	9.600	10.680	6.667	6.364	4.194	4.500	5.500	6.800	5.000	66.861
17	Netherlands	6.777	11.400	9.936	5.840	3.327	2.903	6.000	8.500	7.600	4.500	66.783
18	Finland	7.480	10.400	10.260	5.680	3.636	4.516	5.000	9.000	6.800	4.000	66.772
19	France	6.690	8.800	10.194	6.533	5.455	4.839	9.000	8.500	4.400	1.500	65.911
20	Ireland	6.760	8.800	8.958	5.373	4.091	6.452	6.500	7.500	6.400	5.000	65.834

**Table 2: List of scores by indicators of top twenty countries (economies)**

In the top 10 of the 2017 rankings, there is not much change compared to 2016. The positions of Japan, Estonia, and Canada have increased and ranked at 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> place respectively.

As the aforementioned situation, Japan government has built a sophisticated promotion system for D-Government initiatives and precise GCIO regimes into every rank of government (Central and local government; different government agencies) to assure the implementation and evaluation process of D-Government initiatives. It can be reported on high scores on “Government CIO” and “D-Government Promotion”. Japan also continues to update its online service system as the objective of initiatives to simplify administrative procedures and working systems.

Canada has kept its pioneer position among other countries in providing advanced e-services to citizens, which has a splendid one-stop service system endeavoring to embrace all the information and services that citizens or enterprises need at one unified

place. Massive contents have been divided into very plain and concise catalogs and users can always go to the destination directly through humanized introduction.

In comparison with last year, South Korea downed from the 4<sup>th</sup> place to 8<sup>th</sup> place, due to several political, government change in South Korea. However, in some indicators, South Korea is still the leading countries, such as Cyber Security and Emerging ICT.

In the middle of the 2017 rankings, some countries such as Thailand, Belgium, Switzerland, Spain, and Russia increased some steps, there is not much change in position compared to last year. Only a few countries have a big change in rankings such as UAE increased six grades compared to last year, China up 4 steps, Chile down 6 steps, Georgia increased six grades compared to the last year.

Compared with other economies, China has a comparatively slow process of D-Government development. Except for the indicator of “Management Optimization”, performance on all the segments of ranking could be considered backward than advanced nations. The absence of GCIO not only pares down the scores for evaluation but more importantly, has influenced the execution of ICT plans in each government level. However, some megacities in China has promoted advanced e-Service and data share process to citizens (For example Beijing, Shanghai, Guangzhou), which continues to pull ahead of the gap with underdeveloped areas.

Chile has achieved its D-Government success due to three main factors: a continuous long-term strategy, efficient policy-making and its modern socioeconomic qualities. Unlike other countries in the region, Chile began designing its long-term D-Government policy plans by the early 2000s, when its first web page for official procedures, “Easy Errand,” was created. By 2004, Chile had designed its first Digital Agenda to start with a continuous process that would lead up to today’s 2013-2020 versions.

There has been very little progress in Georgia regarding the provision of D-Government services. Most of the D-Government services such as E-tender, Social Security Services, Civil Registration Services, Consular Services and Labor Related Services are provided at static websites available. E-payment and e-voting services are not available yet.

## **II. D-Government Ranking by Indicators-Sector Analysis**

The Waseda – IAC D-Government Ranking relies on comprehensive benchmarking indicators in order to obtain an accurate and precise assessment of the latest developments of D-Government in the ICT section of 65 countries. Ten main indicators are currently used to carry out the Waseda - IAC D-Government Ranking survey. The table below shows all 10 indicators and their 35 sub-indicators.

Indicators	Sub-indicators
1. Network Preparedness/Infrastructure (NIP)	1-1 Internet Users 1-2 Broadband Subscribers 1-3 Mobile Cellular Subscribers
2. Management Optimization/ Efficiency (MO)	2-1 Optimization Awareness 2-2 Integrated Enterprise Architecture 2-3 Administrative and Budgetary Systems
3. Online Services / Functioning Applications (OS)	3-1 E-Procurement 3-2 E-Tax Systems 3-3 E-Custom Systems 3-4 E-Health System 3-5 One-stop service
4. National Portal/Homepage (NPR)	4-1 Navigation 4-2 Interactivity 4-3 Interface 4-4 Technical Aspects
5. Government CIO (GCIO)	5-1 GCIO Presence 5-2 GCIO Mandate 5-3 CIO Organizations 5-4 CIO Development Programs
6. D-Government Promotion (EPRO)	6-1 Legal Mechanism 6-2 Enabling Mechanism 6-3 Support Mechanism 6-4 Assessment Mechanism
7. E-Participation/Digital Inclusion (EPAR)	7-1 E-Information Mechanisms 7-2 Consultation 7-3 Decision-Making
8. Open Government (OGD)	8-1 Legal Framework 8-2 Society 8-3 Organization
9. Cyber Security (CYB)	9-1 Legal Framework 9-2 Cyber Crime Countermeasure 9-3 Internet Security Organization
10. The use of Emerging ICT (EMG)	10-1 The use of Cloud Computing 10-2 The use of Internet of Things 10-3 The use of Big Data

**Table 3: The Main Indicators and Sub-Indicators**

Network Preparedness			Management Optimization			Online Services		
No	Country	Score	No	Country	Score	No	Country	Score
1	Denmark	7.960	1	Denmark	12.00	1	Denmark	11.64
2	Iceland	7.620	1	Japan	12.00	1	Singapore	11.64
3	Sweden	7.617	1	Estonia	12.00	3	Israel	11.40
4	Norway	7.557	4	Switzerland	11.50	4	Iceland	11.28
5	Finland	7.480	4	New Zealand	11.50	5	Estonia	10.974
6	Japan	7.460	6	Netherlands	11.40	6	Australia	10.920

7	UK	7.250
8	Hong Kong	7.272
9	Australia	7.083
10	Estonia	7.053

6	Germany	11.40
8	UK	11.20
8	Iceland	11.20
8	Oman	11.20

7	USA	10.800
8	Norway	10.680
9	Sweden	10.596
10	Japan	10.530

National Portal		
No	Country	Score
1	Denmark	7.852
2	Israel	7.407
2	USA	7.407
2	Lithuania	7.407
5	Singapore	7.400
6	Australia	7.333
7	Iceland	7.111
8	South Korea	6.985
9	Belgium	6.815
10	Canada	6.800

Government CIO		
No	Country	Score
1	USA	9.091
1	Japan	9.091
3	Singapore	8.636
4	Canada	7.727
4	Taiwan	7.727
4	Estonia	7.727
4	New Zealand	7.727
8	Denmark	7.273
8	Australia	7.273
8	Iceland	7.273

D-Government Promotion		
No	Country	Score
1	Singapore	9.677
2	Japan	9.355
3	USA	8.548
4	Australia	8.387
5	Denmark	8.065
6	South Korea	7.742
7	Taiwan	7.419
7	Estonia	7.097
9	UAE	6.774
9	Poland	6.774

E-Participation		
No	Country	Score
1	Singapore	9.500
1	Denmark	9.500
3	USA	9.250
4	Estonia	9.000
4	Canada	9.000
4	France	9.000
7	UAE	8.750
8	Italy	8.500
8	Sweden	8.500
8	UK	8.500

Open Government		
No	Country	Score
1	Canada	10.00
1	New Zealand	10.00
3	Singapore	9.500
3	Indonesia	9.500
5	India	9.250
5	Spain	9.250
5	USA	9.250
8	Denmark	9.250
9	Italy	9.000
9	UK	9.000

Cyber Security		
No	Country	Score
1	New Zealand	10.00
2	Singapore	9.800
3	UK	9.600
4	Denmark	9.200
4	Switzerland	9.200
4	Israel	9.200
7	USA	9.000
8	South Korea	8.800
8	Estonia	8.800
10	Austria	8.400

#### The use of Emerging ICT

No	Country	Score
1	Denmark	7.000
2	Singapore	6.750
3	USA	6.500
4	Norway	5.000
4	Germany	5.000
4	Ireland	5.000
7	Estonia	4.500

7	Netherlands	4.500
7	Belgium	4.500
7	Australia	4.500

**Table 4: Top 10 Countries on 10 Individual Indicators**

**1. Network Preparedness/Digital Infrastructure**

According to the Waseda D-Government ranking, network preparedness (or digital infrastructure) is a basic indicator for evaluating D-Government development in one country. In this ranking, digital infrastructure is measured by the development of ICT such as the number of Internet users, mobile subscribers or the percentage of broadband connections. Network preparedness also refers to the integration between central government and local government through network backbone system and its capability of connecting all bureaus and departments together via the core Government Backbone Network.

Iceland with steady development and implementation of ICT services and infrastructure is No.2 in the world after Denmark. It has been ranked fourth in the world for ICT Development by the International Telecommunication Union (ITU) for the past three years. With a usage rate of 96.5%, Icelandic citizens are more likely to use the Internet than the citizens of any other country. 35.1% of citizens had wired broadband subscriptions in 2013, and 74.7% had wireless broadband access, placing the country within the top five for this metric.

As one of the world’s best-connected countries, Sweden as No.3 of this sector has 100% cell phone subscriptions with data, 90% Internet users, 87% households with personal computers, and 32% broadband subscribers. All of these conditions combine with an early interest from decision-makers on IT, have turned Sweden into a prominent ICT nation with good infrastructure and advanced services. In fact, Sweden is one of the international leaders with regards to D-Government. The Swedish government has formulated strong policies in this progress.

**2. Management Optimization**

This indicator reflects the utilization of ICT for improving government business processes and internal processes (back office in each organization). Management optimization is a very important indicator of D-Government development because it related to the optimization awareness, enterprise architecture (EA) and also the administrative management system.

Japan as No.1 rank is one of the earliest countries to push the integrated government systems and has made lots of progress such as the GPKI (Government Public Key Infrastructure) and “Kasumigaseki WAN” system. As of 2017, most of the 87-optimization target areas are in the implementation phase. Prime Minister’s IT

Headquarter started “The most advanced IT Nation” Strategy to implement D-Government as the priority area productivity and efficiency since 2013.

Estonia as No.1 rank in this indicator has launched the Digital Agenda 2020. The ultimate goal of this agenda is not merely an ICT use in daily life and business. The current plan emphasizes the improving economic competitiveness, the well-being of people and the efficiency of public administration. Some priorities have been set on the agenda such as completing the next generation broadband network, generating greater control over personal data, and utilizing data analytics in public sectors.

Switzerland government uses Business Process Model Notation (BPMN) for illustrating government business process. This practice will enable to identify redundancy or critical process that could be eliminating or adding more control over it. Digital Government Strategy Switzerland was created through a collaboration between central and local government. The strategy has set the role and responsibilities of each agency. There are measurable target and objectives on the D-Government Strategy. Furthermore, the strategic plan has been cascaded into a more detailed action plan.

### **3. Online Services/ Applications**

Online service is one of five important indicators. It was evaluated in the first ranking survey in 2005 and referred to the interactions between service providers and customers. Online service or electronic service (e-Service) refers to the integration of business process, policies, procedures, tools, technologies, and human efforts to facilitate both assisted and unassisted customer services provided over the Internet and other networks. E-Services are the main indicator in the development of D-Government. The outcome of D-Government is e-Services or products/services that the government introduces to citizens, making e-Service as the interface of D-Government. Over twelve years of ranking, there has been no significant change in this indicator or its associated sub-indicators. We found that e-Services have been implemented and expanded in many governments around the world and have become primary solutions in D-Government development.

To enhance the security and resiliency of the cyber and communications infrastructure of the United States as No.7 rank, a new Cybersecurity Act was issued in 2012 and it focused on protecting ICT critical infrastructure, Information sharing, governmental and private networks. The current statutes for required interfaces will be enhanced and revised. The “Electronic Transactions and Information Law” which was enacted in the U.S. regulates all matters pertaining to information and transactions in all electronic forms. The Law regulates cyber activity in the U.S. It provides a general outline, and requires further elaboration through government regulations.

#### **4. National Portal/Homepage**

National portal (one-stop service) is defined as a place where the government integrates all e-services and makes them accessible via one gateway. It is also a basic interface for stakeholders to access government in an electronic way. Through the national portal, governments offer many benefits to users of public services—from citizens and businesses to the public administrators themselves—including faster, cheaper and superior services. In the public sector, one-stop service is one of the most promising concepts of service delivery in public administration. Its implementation is included in the D-Government strategies in most countries.

National Portal of Singapore contains proper information for local citizens and foreigners. The portal has provided latest national news, useful guidelines for every aspect of Singapore life (divided by topics such as Finance, Education, Immigration, Taxes, Health, etc.) Besides, the portal has the introduction of country information, visions for the nation, to present the country to users closely and deeply. There are also contacts information of government agencies and their announcement individually. Though online translation supports users to search government terms into Chinese, Malay, and Tamil, it would be better if the portal equips multiple language versions of all the information.

#### **5. Government Chief Information Officer (GCIO)**

Since 2005, in the first Waseda D-Government ranking, the GCIO plays an important role in D-Government implementation. It is also one of five indicators for evaluating D-Government. The CIO is expected to align management strategies with ICT investment in order to achieve a balance among business strategy, organizational reform, and management reform; hence, the Government CIO is considered by many governments to be one of the key factors in the success of D-Government implementation. CIOs are now expected to achieve quantum-leaps in efficiency, offer previously unheard-of capabilities, create actionable information out of disparate data sets, provides citizen services that are so fast, accurate, and user-friendly that the public's trust in government achievement record heights.

The CIO position of United States as No.1 rank was established within the White House's Office of Management and Budget (OMB) to provide leadership and oversight for IT spending throughout the Federal Government. In addition, each Federal agency has its own CIO, as established by the Clinger-Cohen Act.

In Japan, each central ministry has a CIO who is appointed to senior staff within the ministry (mainly Director General of administration) and an assistant CIO who is an expert recruited externally. Federal CIO Council composed of Ministry CIOs has the authority to decide many rules on in-house ICT installation and online services. The percentage of CIO appointments at the prefecture level is 95% and 90% is at the city

level in 2017. The government established a Government CIO post as a core of all Ministry CIOs who leads to ranking in 2017.

Government Chief Information Office Wing has been set up at Gov Tech which serves as the government CIO for Singapore. There are also clearly appointments about CIOs at every government agency, responsible for specific objectives on Infocomm technologies, infrastructure, and services. Government CIO issues are valued at Singapore, but there are still needs to establish assorted educational programs related to GCIO.

## **6. D-Government Promotion**

This indicator measures a government's activities toward the promotion of D-Government and distribution of e-Services to citizens, businesses, and other stakeholders. It includes activities involved in supporting the implementation of D-Government such as legal frameworks and mechanisms (laws, legislations, plans, policies, and strategies). In other words, the government carries out these activities in order to support the development of e-Services as well as D-Government as a whole. This indicator is one of the main indicators in Waseda-IAC D-Government ranking because it shows the main legal framework in each country.

The high-tech and informational society is one of the vital national strategies in Singapore, therefore government never has stopped the evolution of D-Government. Not only the continuous plans but also relevant legal framework has a renewal in the past years. Academic support including seminars and research centers on D-Government and ICT utilization are active in Singapore. It ranked the first in this indicator among evaluated countries.

The digital interactions among the U.S. government, citizens, businesses, employees and other governments improved from a couple of years ago. This clearly results from the efforts to develop and promote Digital Government services and processes by the establishment of an Administrator Office of Digital Government within the Office of Management and Budget. The promotion of the use of the Internet and other information technologies to increase opportunities for citizens to participate with the U.S. Government and promoting interagency collaboration providing digital Government services, where these collaborations would improve the services provided to citizens by integrating related functions and the use of internal digital Government processes.

To provide effective leadership of the Federal Government, there have been efforts to develop and promote digital Government services and processes by establishing an Administrator Office of Digital Government within the Office of Management and Budget. D-Government promotion has reduced the cost and burden for businesses and government entities.

## **7. E-Participation/ Digital Inclusion**

E-participation refers to ICT-supported participation in government and governance processes. Processes may be concerned administration, service delivery, decision-making, and policy-making.

In Canada as No.4 rank in this indicator, e-services or online services, online information and online citizen engagement are organized by category and not on a department-by department basis, which makes it user-friendly and responsive to citizen demands. In order to gauge the efficacy of their services, the government uses a unique Canadian outcomes analysis approach called “Citizens First” in the case of individuals and families, and “Taking Care of Business” in the case of companies. So it enables everyone to use an electronic form of services very easily. The Government of Canada offers a variety of applications, accounts, tools, and services to allow citizens to complete tasks online.

The UAE D-Government believes in the importance of e-Participation and enabling its customers to take part in the decision-making process. The government portal clearly encourages citizens and customers to participate in government decision making process including policies and initiatives. The “Contact Government” section in the portal is dedicated by providing many important tools, including web 2.0 tools and online direct communication with the customer. The UAE Government has launched its new federal portal, redesigned to offer many e-Participation channels, include advanced practices such as Open Data, and be a better-unified gateway to access many online services provided by the UAE Government.

## **8. Open Government Data**

This indicator evaluates the openness and transparency of governments. The top-ranking countries on this indicator have provided citizens with an application-programming interface (API) that could help developers and researchers create innovative citizens-centric applications. There are a number of small-scale utilization cases and applications for smartphones and tablets.

In 1982, New Zealand as No.1 rank has launched Official Information Act to participate in the “Freedom of Information Act” movement around the world. To strengthen the implementation of this act, New Zealand has established Open Data Portal (<https://data.govt.nz>) to provide public with government information. To keep the information update, New Zealand government uses Data one.govt (Open Network Environment) as a platform for data submission.

Indonesia has established Open Data Portal (<http://data.go.id/>) to provide public with government information. Jakarta City also developed Open Data at <http://data.jakarta.go.id>. To keep the information up-to-date, Indonesian government

involves the community in the area of Open Data to standardize and reformat all interesting data available on the government website to be displayed on the Open Data Portal. In developing countries, Open Government Data is the key for transparency and helping business most creative.

## **9. Cyber Security**

The emerging trends in ICT and security are reflected in the ranking system since top 10 countries in cyber-security have an adequate legislation framework, effective cyber-crime countermeasure solutions, and powerful security organizations.

In five years, from 2011 to 2017, the UK Government has financed a “National Cyber Security Program” of £860 million to deliver the 2011 National Cyber Security Strategy. Some activities included in the program: the launch of “10 Steps to Cyber Security” in 2015 together with new guidance for businesses: “Common Cyber Attacks: Reducing the Impact”; “Think Cyber – Think Resilience” seminars for around 700 policy makers and practitioners from local authorities; the Foreign Secretary publicly confirmed the “Centre for Cyber Assessment (CCA)” to provide assessments of cyber threats and vulnerabilities to policymakers; provide briefing and training to public sector staff in the roles of information security.

New Zealand as No.1 rank has established the Government Communication Security Bureau (GCSB) for providing information assurance and cyber security to the New Zealand Government and critical infrastructure organizations, foreign intelligence to government decision-makers, and cooperation and assistance to other New Zealand government agencies. Besides that, an ICT Community New Zealand initiated the foundation of New Zealand Internet Task Force to improve the cyber security posture of New Zealand.

## **10. The use of Emerging ICT**

This indicator refers to the newest technology which governments want to apply for the Government activities such as using Cloud computing in delivering services, creating data warehouse (Big data) for sharing among Government agencies, and use the advantages of IoT for distributing services through many devices.

The Danish government as No.1 rank has been using a domestic standard for information security called DS 484 for over a decade. Government institutions are required to abide by Information Security ISO/IEC 27001, an international standard. The Ministry of Finance’s Agency for Digitization is tasked with enforcing this standard and “developing tools, templates, seminars, and workshops to support its implementation and maintenance.”

The German Federal Government is pursuing to boost up the development and introduction of cloud computing facilities by issuing the new “Cloud Computing Action

Program”. There is a research project known as THESEUS, aiming to utilize The Internet of Services and the Internet of Things. With this project, the German Federal Government is seeking to utilize semantic technologies and the creating new standards for the Internet of Services.

### III. D-Government Ranking by Organizations

#### 1. Ranking of APEC Economies

APEC Economies			APEC Economies			APEC Economies		
No	Economies	Score	No	Economies	Score	No	Economies	Score
1	Singapore	91.057	8	Australia	68.396	15	Chile	53.610
2	USA	87.117	9	Thailand	65.200	16	Mexico	53.441
3	Japan	81.236	10	HK SAR	63.695	17	China	52.865
4	Canada	77.425	11	Russia	58.449	18	Vietnam	50.540
5	New Zealand	75.041	12	Indonesia	58.032	19	Brunei	49.791
6	South Korea	74.828	13	Philippines	57.346	20	Peru	45.702
7	Chinese Taipei	73.224	14	Malaysia	56.386			

**Table 5: D-Government Ranking in APEC Economies**

Singapore, USA, and Japan are the leading economies in this group. They are ranked in the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> position respectively. Compared to last year South Korea is not in the top three, despite the leading country in both Cyber Security and Open Government Data indicators. In the overall of ranking, South Korea slipped down and ranked in 6<sup>th</sup>. Canada and New Zealand followed Japan and ranked for 4<sup>th</sup> and 5<sup>th</sup> place respectively. In the middle of the group Australia, Thailand, Hong Kong, and Russia are keeping their positions compared to the ranking of last year. Indonesia and Philippines jumped one and two steps and ranked for 12<sup>th</sup> and 13<sup>th</sup> place respectively. In the bottom of the group, there are still five countries compared to last year of ranking Mexico, China, Vietnam, Brunei, and Peru. China runs two steps and ranked for 17<sup>th</sup> place compared with 19<sup>th</sup> last year. Peru has been still in the bottom of the group due to little change in the state administration on digital government.

As a leading nation of D-Government in Asia, Singapore continues to maintain the momentum of evolution. The performance on indicators of Management Optimization, D-Government promotion, and cyber security are showing its strong points and advancement this year. Especially on the effort for cyber security, Singapore equips the law and regulatory framework to assure every safety measure and security upgrade can be enforced on a legal basis. In respect to policy, National Cyber Security Masterplan

2018, as the latest strategy, guides government to enhance nation's security environment and create a robust and trusted society for public, private and individuals. Continuous master plans in each crucial segment are one of the keys to keep Singapore proactive and possessing execution capacity on D-Government development.

To future direction, Singapore still has potential on the growth of the usage of emerging technologies. This indicator has been introduced to Waseda D-Government ranking this year. Due to the fact that many countries are still at the start-up phase, direction for expanding the new technologies into public service sector needs more endeavor to be clarified. Singapore could seize the opportunity to formulate policies and standards, not only guide domestic innovation but also delight international co-development.

## 2. Ranking of OECD Countries

OECD Countries			OECD Countries			OECD Countries		
No	Country	Score	No	Country	Score	No	Country	Score
1	Denmark	88.739	11	Australia	68.396	21	Israel	62.949
2	USA	87.117	12	Iceland	68.077	22	Portugal	62.721
3	Japan	81.236	13	Germany	67.212	23	Italy	62.707
4	Estonia	81.198	14	Norway	66.861	24	Czech	60.998
5	Canada	77.425	15	Netherlands	66.783	25	Spain	58.804
6	New Zealand	75.041	16	Finland	66.772	26	Poland	56.317
7	South Korea	74.828	17	France	65.911	27	Turkey	55.527
8	UK	74.214	18	Ireland	65.834	28	Chile	53.610
9	Austria	70.929	19	Belgium	65.189	29	Mexico	53.441
10	Sweden	70.234	20	Switzerland	63.788			

**Table 6: D-Government Ranking in OECD Countries**

Denmark is a leader country in the ranking group; it replaced USA and become No.1 country for OECD ranking group this year. Followed by USA, Japan, Estonia, and Canada as the top 5. They are ranked 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> place respectively. In the middle of the group is Nordic countries, these countries are always in the top countries of both network infrastructure and management optimization. The bottom five countries are Spain, Poland, Turkey, Chile, and Mexico. They ranked for 25<sup>th</sup>, 26<sup>th</sup>, 27<sup>th</sup>, 28<sup>th</sup>, and 29<sup>th</sup> place respectively. There are not so much change in the position compared to the ranking last year.

Denmark has shown marked development in D-Government projects but there are few available resources on D-Government related promotions particularly at the local

level. From 2011 to 2015, the Danish authorities followed a successful D-Government strategy, which included a large-scale communication campaign to raise citizens' awareness of D-Government services. The OIO Committee for Architecture and Standards has the mandate to support the strategy to facilitate the work of D-Government in the state, regions, and municipalities with particular emphasis on ensuring interoperability between IT systems across organizational boundaries.

The government released its e-Government strategy 2016 - 2020 in May 2016, and it outlines 33 projects for the government to accomplish in the coming years. The government is always trying to establish online services that are simpler and more effective. In order to do this, the government will establish horizontal cooperation throughout local, regional and central governments. Institutions for education, knowledge or culture can still apply for funds to provide their users with free Internet access. The funds will be used to prioritize Internet connectivity and use. The government will also invest 500 million DKK and municipalities will up to 1 billion DKK tailoring teaching in public schools for future needs.

## IV. Digital Government Ranking by the Size of Population and GDP

### 1. Ranking in Big Population Countries (bigger than 100 million)

Big Population Countries			Big Population Countries			Big Population Countries		
No	Country	Score	No	Country	Score	No	Country	Score
1	USA	87.117	5	Philippines	57.346	9	Brazil	50.475
2	Japan	81.236	6	India	57.071	10	Pakistan	40.621
3	Russia	58.449	7	Mexico	53.441	11	Nigeria	37.443
4	Indonesia	58.032	8	China	52.865			

**Table 7: D-Government Ranking in Big Population Countries**

In the Waseda D-Government ranking, there are 11 countries which have the population with over than 100 million. In the top four of the ranking group, there are still four countries USA, Japan, Russia, and Indonesia. In the top five, Philippines replaced India compared to last year. Philippines has the impressive point on Management Optimization, Open Government Data, and Online Service. With the comprehensive D-Government Master Plan, Philippines is able to improve those three indicators. In this group, Philippines is attempting to pursue the connected yet integrated government under the theme “iGovPhil” Initiative. The effort to achieve the connectivity and interoperability among government agencies is equipped with the proper equipment on Open Government Data which ensures that all stakeholders can take the benefit of government data. To engage the citizen and business enterprise for

using D-Government system, Philippines is continuously enhancing the Online Service. In the bottom are two countries Pakistan and Nigeria, where they ranked the same place as the ranking last year.

Though more than 75% of Internet users have visited a U.S. government website, reports consistently show that public sector websites lag the private sector. Additionally, the government has failed to meaningfully integrate lessons learned from best practices of leading online government services into its operations. Because public sector websites lag the private sector in usability and design, the Federal Web Managers Council should benchmark the design and usability of government websites against leading industry best practices. The Office of Management Budget should continually recommend specific improvements that agencies should make highlight best practices in its annual D-Government Report to Congress and deploy the D-Government Fund to help replicate best practices across the federal government. The U.S. government has already made some steps in this direction, but more should be done in the coming years.

## 2. Ranking in Small Population Countries (Less than 10 million)

Small Population Countries			Small Population Countries			Small Population Countries		
No	Country	Score	No	Country	Score	No	Country	Score
1	Singapore	91.057	9	Finland	66.772	17	Oman	53.426
2	Denmark	88.739	10	Ireland	65.834	18	Brunei	49.791
3	Estonia	81.198	11	Switzerland	63.788	19	Lithuania	46.956
4	New Zealand	75.041	12	HK SAR	63.695	20	Uruguay	44.847
5	Austria	70.929	13	Israel	62.949	21	Costa Rica	34.200
6	Norway	70.234	14	Macau	61.145	22	Fiji	33.897
7	Iceland	68.077	15	UAE	57.295			
8	Sweden	66.861	16	Bahrain	53.480			

**Table 8: D-Government Ranking in Small Population Countries**

The Waseda ranking covers 22 countries which they have a population less than 10 million. In the top three are Singapore, Denmark and Estonia. The ranking this year marked Austria replaced Norway in the 5<sup>th</sup> place. Iceland jumped 2 steps and ranked in 7<sup>th</sup> place compared to the 9<sup>th</sup> place of 2016 ranking. Finland ranked in 9<sup>th</sup> place and with an advanced D-Government development level, the D-Government promotion activities of Finnish Government are no longer surrounded the matter of citizens' awareness. Instead, the target is focusing on how to improve users' experience with government digital services due to the increase in citizens' expectation. More attentions need to be

paid to the utilizing of emerging technology such as internet of things or big data within government agencies.

The bottom of this group are Oman, Brunei, Lithuania, Uruguay, Costa Rica, and Fiji, they ranked 17<sup>th</sup>, 18<sup>th</sup>, 19<sup>th</sup>, 20<sup>th</sup>, 21<sup>st</sup>, and 22<sup>nd</sup> place respectively. In Fiji, the D-Government program involves three (3) main streams: Public Contact Center (PCC), Government Information Infrastructure (GII) and E-Applications. These 3 streams address the tasks of handling inquiries or complaints from the public, connection of government offices to the network and managing and developing various government online applications for the D-Government SharePoint Framework respectively.

The operationalization of X-Road has brought the Management Optimization as the best indicators for Estonia. X-Road enables secure Internet-based data exchange between the state’s information systems. Not only state’s information system but also private sector can take the benefits of X-Road. In addition to that, citizen uses X-Road seamlessly by using Citizen ID, due to the fact that interaction with government is considerably simple through Online Participation Portal. As a result, the e-Participation indicator for Estonia places the second-best performer. The situation is similar to Online Service indicator that sets the third best performer. Despite the excellent score on these three best indicators; Estonia still has weakness on utilizing the emerging ICT. Emerging ICT is the new indicator in the year 2016 ranking. Also, this new technology; Cloud Computing, Big Data, and IoT are still the new challenges for government due to their concerns about security. Since many countries are still attempting to take the optimum benefit of emerging ICT, there are many rooms for improvement in this domain.

### 3. D-Government Ranking in Top 10 Countries with Highest GDP in the World

Highest GDP Group			Highest GDP Group		
No	Country	Score	No	Country	Score
1	USA	87.117	6	France	65.911
2	Japan	81.236	7	Italy	62.707
3	Canada	77.425	8	Russia	58.449
4	UK	74.214	9	China	52.865
5	Germany	67.212	10	Brazil	50.475

**Table 9: D-Government Ranking with Highest GDP Group**

In the group, USA, Japan, Canada, UK, and Germany are ranked for the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> place respectively. In the top 5, Germany is a new country compared with the last year of ranking. In the attempts to promote for publishing government datasets and information, early 2015, German Government presented “The General Government’s

National Action Plan to implement the G8 Open Data Charter”. By doing this the government put into action one of its pledges to maintain the top position in Open Government ranking indicator. In the bottom of the ranking group, there are still Russia, China, and Brazil. They ranked in 8<sup>th</sup>, 9<sup>th</sup>, and 10<sup>th</sup> place respectively. Brazil is now still struggling to improve the efficiency of the public policy and service for societies via D-Government and tries to improve efficiency and transparency of the management process through giving an opportunity for its citizens to access government information and to participate in some political administrative decisions.

As one of the advanced D-Government nations, Japan keeps its leading impetus at the TOP10 of ranking. As the aforementioned situation, Japan government has built a sophisticated promotion system for D-Government initiatives and precise GCIO regimes into every rank of government (Central and local government; different government agencies) to assure the implementation and evaluation process of D-Government initiatives. It can be reported on high scores on “Government CIO” and “D-Government Promotion”. Japan also continues to update its online service system as the objective of initiatives to simplify administrative procedures and working systems. However, National Portal seems to be the only weak point for D-Government in Japan. (<http://www.japan.go.jp/>) Some basic information including demographic data and introduction to Japan political situation has been provided at the site, but it still needs much more necessary functions to serve visitor’s needs rather than providing information only. In consideration of the coming Tokyo Olympic Games that massive visitors would choose national portal as a reference, it is a chance and challenge at the same time for Japan government to reconsider that what is the appropriate way to provide information and deliver e-service to Japanese and non-Japanese through the internet.

## V. D-Government Ranking by Regions

### 1. Ranking in Asia-Pacific Countries

Asia-Pacific Countries			Asia-Pacific Countries			Asia-Pacific Countries		
No	Country	Score	No	Country	Score	No	Country	Score
1	Singapore	91.057	7	Thailand	65.200	13	Malaysia	56.386
2	Japan	81.236	8	HK SAR	63.695	14	China	52.865
3	New Zealand	75.041	9	Macau	61.145	15	Vietnam	50.540
4	South Korea	74.828	10	Indonesia	58.032	16	Brunei	49.791
5	Taiwan	73.224	11	Philippines	57.346	17	Pakistan	40.621
6	Australia	68.396	12	India	57.071	18	Fiji	33.897

**Table 10: D-Government Ranking in Asia-Pacific Countries**

Singapore, Japan, and South Korea are three leaders of countries in this group. They also are in the top 10 countries in the overall ranking. Even South Korea ranked in

the 8<sup>th</sup> in total ranking, but it has a good position in Asia-Pacific countries. Followed the top three countries are New Zealand, Chinese Taipei, and Australia. They ranked 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> respectively. Chinese Taipei has great performance on the indicator of “Open government”, showing government’s effort actions to achieve the goals that have been emphasized in aforementioned national plans. As a matter of fact, Transparency, Accountability or E-democracy has always remained social focus in the society.

Australia has shown incredible progress over the past few years in developing its digital government efforts and has quickly become one of the leading innovators in this area. The addition of the Digital Transformation Agency this past year was one major addition in the past year, and it appears to be primed to continue to compete with other top governments in the coming years. Australia is also a leader in e-Participation, and its mandatory voting policy provides an impetus for the government to ensure that it is simple and easy for each citizen to participate fully in the democratic process.

In the bottom of this group are China, Vietnam, Brunei, Pakistan, and Fiji. They are in the same places compared with the ranking last year. They ranked in 14<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup>, 17<sup>th</sup>, and 18<sup>th</sup> place respectively. Vietnam has its highest score on Management Optimization among them, which reflects the efforts of government in utilizing ICT in state administration bodies’ operations. The Resolution No. 36a / NQ-CP issued by the Government on October 2015 identify general visions on D-Government such as promoting the development of D-Government; improve the quality and efficiency of the activities of State agencies to serve citizens and businesses better. However, online service delivery is still very limited, despite a high rate of Internet penetration. Most of the online services are at interactive level, calling for necessary activities of the government to boost the administrative reform process. Lack of consistent direction in D-Government implementation, especially in local governments, resulted in the high fragmentation in D-Government initiatives and impedes collaboration and data sharing among agencies. Cyber security is another weak point of the country as the lack of necessary security mechanisms and legal framework made online transactions become more vulnerable to cyber threats. Although there has been some progress from the Vietnamese government on D-Government development, the outcome is still far from meeting expectations. This implies that the government should pay attention not only to technology investments but also to other indispensable determinants such as leadership commitment, legislative framework, inter-cooperation among government agencies and strict supervision from independent bodies.

## 2. Ranking in Americas Countries

Americas Countries			Americas Countries			Americas Countries		
No	Country	Score	No	Country	Score	No	Country	Score
1	USA	87.117	5	Brazil	50.475	9	Colombia	43.099

2	Canada	77.425	6	Argentina	45.776	10	Venezuela	38.946
3	Chile	53.610	7	Peru	45.702	11	Costa Rica	34.200
4	Mexico	53.441	8	Uruguay	44.847			

**Table 11: D-Government Ranking in Americas Countries**

Waseda D-Government ranking covers 11 Americas countries, in which both USA and Canada are ranked in the first and the second place respectively, followed by Chile, Mexico, and Brazil for the 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> place. Chile has achieved its D-Government success due to three main factors: a continuous long-term strategy, efficient policy-making and its modern socioeconomic qualities. Good D-Government systems in Chile have engaged people to a good level of e-participation, but this certainly does not mean that there is a better overall democratic process. Other factors – such as citizen’s knowledge and understanding of policies that concern them – must be taken into consideration to find integral solutions. It is necessary to inform citizens and provide proper education in use of the new tools to see major benefits offered by these new opportunities.

Canada has kept its pioneer position among other countries in providing advanced e-services to citizens, which has a splendid one-stop service system endeavoring to embrace all the information and services that citizens or enterprises need at one unified place. Massive contents have been divided into very plain and concise catalogs and users can always go to the destination directly through humanized introduction. Also, citizens are easy to interact with government agencies due to straightforward communication channels. That’s why Canada has extremely good performance on the indicators of both “Online Service” and “E-participation”. As one of the leading nations in D-Government area, Canada is still expected to get more scores on the latest indicator for the usage of new technologies, which is to have an efficient model of adopting emerging technologies such as Cloud Computing or IoT for developing countries to learn from in the future.

Colombia, Venezuela, and Costa Rica are placed at the bottom of this group. Compared to the last year of ranking Uruguay escaped from the bottom of the ranking group. Uruguay is performing well in open government initiatives. However, this survey suggests that current efforts in e-participation are insufficient. Without any efforts to increase the citizen awareness on D-Government, the huge investment in developing D-Government in Uruguay could become meaningless where citizens do not use the e-Services.

### 3. Ranking in European Countries

EU Countries			EU Countries			EU Countries		
No	Country	Score	No	Country	Score	No	Country	Score

1	Denmark	88.739	8	Norway	66.861	15	Portugal	62.721
2	Estonia	81.198	9	Netherlands	66.783	16	Italy	62.707
3	UK	74.214	10	Finland	66.772	17	Czech	60.998
4	Austria	70.929	11	France	65.911	18	Spain	58.804
5	Sweden	70.234	12	Ireland	65.834	19	Poland	56.317
6	Iceland	68.077	13	Belgium	65.189	20	Romania	55.947
7	Germany	67.212	14	Switzerland	63.788	21	Lithuania	46.956

**Table 12: D-Government Ranking in European Countries**

Denmark, Estonia, and the UK are still in the top three countries compared to the last year of ranking. They ranked in 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> place respectively. Followed by Austria in the 4<sup>th</sup> place, Sweden in the 5<sup>th</sup>, and Iceland in the 6<sup>th</sup> place. In the middle of group, Norway slept down 2 steps compared to the ranking last year. Finland and France are also going down compared to the 2016 ranking. In the bottom of the group are Czech, Spain, Poland, Romania, and Lithuania. They ranked in 17<sup>th</sup>, 18<sup>th</sup>, 19<sup>th</sup>, 20<sup>th</sup>, and 21<sup>st</sup> place respectively.

The UK is remaining one of the best groups on the performance of D-Government area. Most of the indicators are at the very high scores which reflect a well-developed D-Government situation. The main focus of digital government strategy is on how to improve users' experience with online services and reduce the digital divide. Being one of the countries with a high level of D-Government development, the UK government actually did not need to put many efforts on broadcasting D-Government initiatives. Instead, a bunch of policies and guidelines were developed to uniform all D-Government initiatives such as Guidelines for UK Government Websites, Quality Framework for UK Government Website Design, D-Government Metadata Standard Version 3.0, e-Government Interoperability Framework and so on.

The UK government is aiming to enhance public services quality by issuing the Digital by Default Service Standard which mandates all government agencies to follow when developing new digital services. This standard covering 5 different stages of service development: discovery, alpha, beta, live and retirement. As the result, the country has reached a very high rank on online service delivery indicator. Having a high level of capabilities in technology, infrastructure, and telecommunication, the UK Government has a great opportunity to reap the benefits from emerging technologies such as Big Data or Internet of Things to transform the national economy and citizens' life.

#### 4. Ranking in Africa, Middle East, and CIS Countries

Africa, Middle East & CIS	Africa, Middle East & CIS	Africa, Middle East & CIS
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No	Country	Score	No	Country	Score	No	Country	Score
1	Israel	62.949	6	Oman	53.426	11	Morocco	43.787
2	Russia	58.499	7	Kazakhstan	52.476	12	Tunisia	42.986
3	UAE	57.295	8	Saudi Arabia	51.006	13	Kenya	38.705
4	Turkey	55.527	9	South Africa	50.417	14	Egypt	37.735
5	Bahrain	53.480	10	Georgia	49.592	15	Nigeria	37.443

**Table 13: D-Government Ranking in Africa, Middle East, and CIS Countries**

The 2017 Waseda D-Government ranking covers 6 countries from Africa, 5 countries from the Middle East, and 4 countries from CIS. The leading countries in this group are Israel, Russia, and UAE, followed by Turkey and Bahrain in the 4<sup>th</sup> and 5<sup>th</sup> place respectively. Compared to the ranking last year, UAE jumped into the top three. In the middle of the group, there is no significant change in their position. In the bottom of the group are still Kenya, Egypt, and Nigeria. They are ranked in 13<sup>th</sup>, 14<sup>th</sup>, and 15<sup>th</sup> place respectively.

In Israel, all of the governmental and military institutions which address the cyber threat will be transferred to the city of Beer Sheva. Israel also acceded to the Budapest Cybercrime Convention in 2013. The government will continue to support other cooperation mechanisms that contribute to harmonizing cyber defense tools. In Israel, they believe that cyber is not just a threat, but rather an opportunity for creative thought and economic growth. As the reliance on the Internet and the virtual realm increases, the need for cyber defense will only grow.

In Russia, the maturity of services provided through the one-stop portal is not yet uniform among the country regions and is expected to be steadily enhanced. The government aims at least 70% of services to be available through the portal by 2018. Other plans include ensuring the services are available irrespective of geographical location, provision of several channels for service access including mobile access, the internet, call centers and on-site service machines. E-Health systems are expected to be optimized and integrated expanding the services available through one-stop D-Government portal to include requests for sick-leave certificates, electronic prescriptions, and electronic inquiries.

## **VI. New Trends of Digital Government- 5 Highlights in 2017**

Highlights of the remarkable trends of Digital Government in 2017 are as five topics as below. There are well connected each other to support the excellent digital government activities and interrelated with as a part of the Digital Government ranking survey. Five highlights mentioned will be the most important for understanding the 2017 trends of digital economy and innovation.

## **1. Mobile Government**

### **1.1 Outline**

In the context of pervasive digital applications in most areas of our daily life, the economy is shifting to a new form namely the digital economy. In the digital economy, most business transactions are borderless, considerably fast, and secure through the utilization of Information and Communication Technology (ICT). Digital Government is one of the platforms for the government to actively participate in the digital economy. Digital Government encompasses the usage of ICT in government institution to deliver governmental services to government's stakeholders, i.e., citizens (G2C), business enterprises (G2B), and other government agencies (G2G). Digital Government is able to improve the quality of governmental activities. For taking the optimum benefit of Digital Government, governments have primarily focused on the Internet as a mean of service provisioning.

Digital Government has been applied for a long time in most countries around the world with different level, method, and application among them; from least-developed countries to developed countries. In the least developed countries, governments have focused on building telecommunication infrastructure. In the developing countries, they mainly focus on the implementation plans and Digital Government roadmap for each year or a certain period, or on upgrading the network system by raising the proportion of Internet users and broadband connections. On another hand, the developed countries tend to focus on promoting new online services and introducing online services at the highest level to customers.

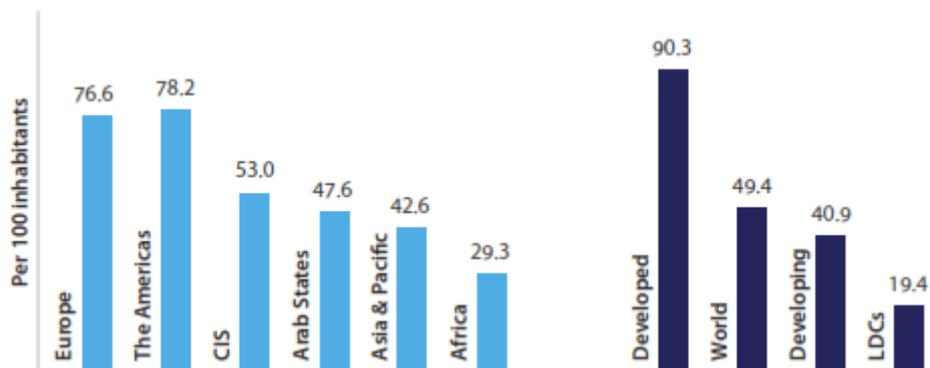
Mobile Government sometimes referred an m-Government as the extension of Digital Government to mobile platforms, as well as the strategic use of government services and applications which made possible of using cellular/mobile telephones, laptop computers, personal digital assistants (PDAs) and wireless internet infrastructure. Mobility is no longer a technological revolution. It is more about how businesses and governments can provide a better social infrastructure through mobile applications and services. Adoption of mobility, therefore, is an indispensable asset for the public sector in meeting the demands of citizens. While Digital Government is an important step taken by many governments, the provisions of services through mobile technologies become compulsory. M-Government emerges as the next big wave in the process of ICT use in the public sector even if supplemented activities to Digital Government. Mobil Digital Government is primarily concerned with the study of this major social and technological transformation in the public sector.

In recent years, the number of smartphones sold in the market is increasing. They have gradually replaced the first mobile generation, along with the rapid development of technology for improving connectivity and quality (4G, LTE) on a smartphone. We can

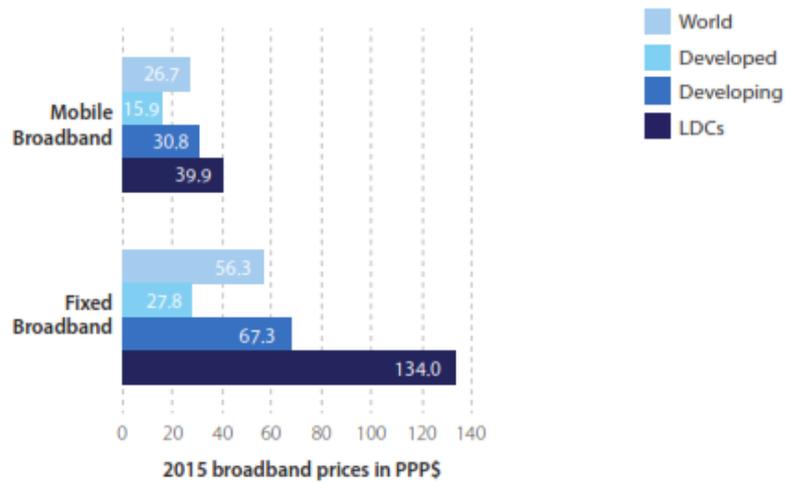
assert that the smartphones completely replace the PC in the future. With the gradual shift from Digital Government to M-Government it will bring the highest efficiency for both suppliers and users. These services can have a major impact include e-education, e-health, transportations, mobile payment services, as well as location based services.

It is found that, with the application of new mobile technologies, Digital Government services have been raised at a higher level of development. The largest utility in the application of m-government is the citizens. And, the governments are constantly connected (online) which makes the deployment of new services by the government is faster and more efficient. The application of m-government also creates many advantages for the universal service, especially to the remote areas, M-government also reduces the digital divide in developing countries, increase transparency in government operations, reduce corruption and always create a connection government with grassroots, this increases people's trust in government.

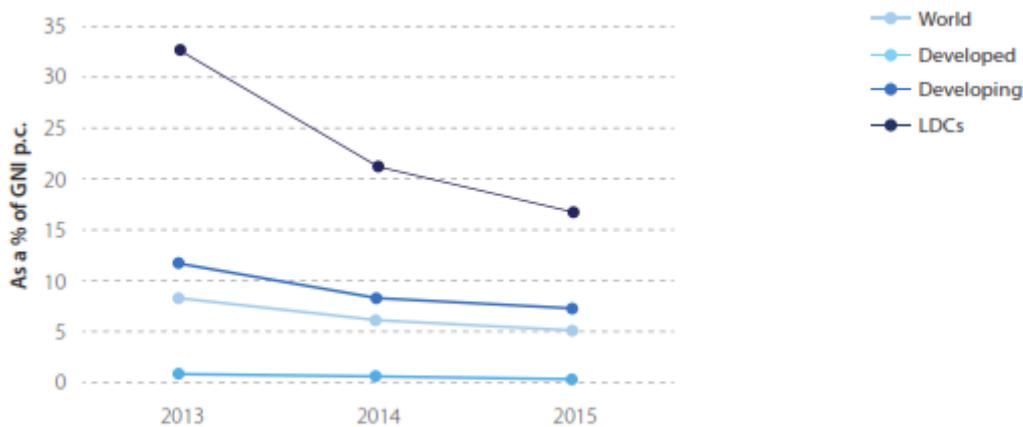
In developing countries, the number of mobile-broadband subscriptions continues to grow, reaching a penetration rate of close to 41%. The total number of mobile-broadband subscriptions is expected to reach 3.6 billion by end 2016. The figure below shows the Mobile-broadband subscriptions in over the world.



**Figure 1: Mobile Broadband Subscriptions (Source: ITU)**



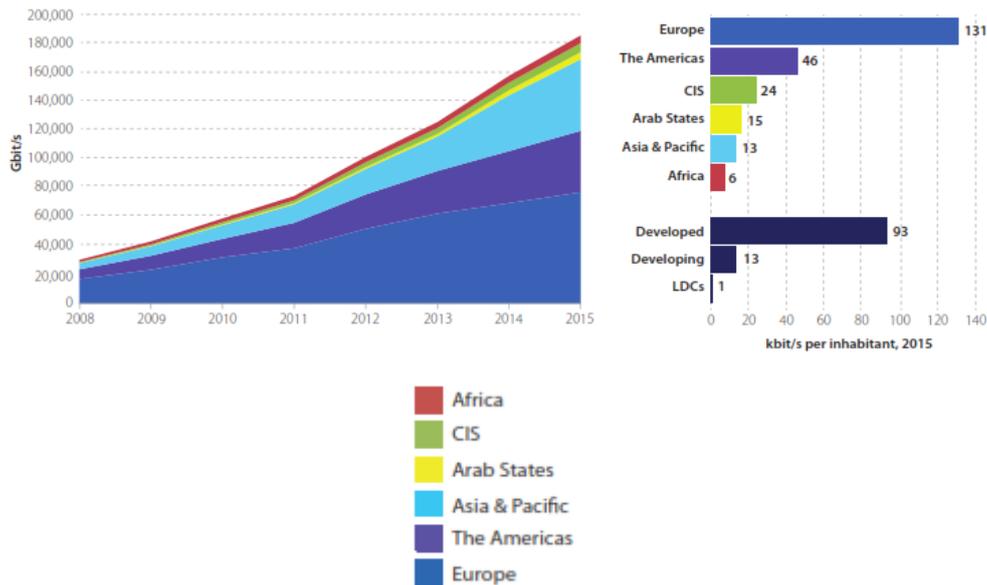
**Figure 2: Fix and mobile broadband prices, PPP (Source: ITU)**



**Figure 3: Mobile Broadband Services as a percentage of GNI (Source: ITU)**

Mobile broadband have become popular than fixed broadband services. By the end of 2015, average mobile broadband prices corresponded to 5.5% of GNI. The average price of a basic fixed-broadband plan is more than twice as high as the average price of a comparable mobile broadband plan. In Least Developed Countries, fixed-broadband services are on average more than three times as expensive as mobile-broadband services.

Internet bandwidth remains unequally distributed across the world (Source: ITU). By early 2016, total international Internet bandwidth had reached 185'000 Gbit/s, up from 30'000 compared to 2008. Africa has the lowest international connectivity of all regions: there is twice as much bandwidth per inhabitant available in Asia and the Pacific, four times as much in the CIS region, eight times as much in the Americas and more than twenty times as much in Europe. Lack of international connectivity is a major bottleneck in the Internet infrastructure of LDCs.



**Figure 4: Internet bandwidth remains unequally distributed across the world**  
(Source: ITU)

## 1.2 Typical Example

### 1.2.1 Singapore

Singapore is one of some developed countries which have been applied ICT successful in the field of Digital Government and especially the application on a smartphone. In Singapore, mobile penetration is nearly 98 percent. Therefore, the government of Singapore can easily deliver mobile service to all citizens (G2C), business (G2B), and other stakeholders (G2G).

In Singapore, a Mobile Government (m-Government) has become a part of the eGov2015 master plan which was introduced in June 2011. When issuing m-Government, the Singapore government wants to increase the reach and richness of government e-services to our customers by deploying more feature-rich and innovative mobile services.

Nowadays, Singapore has more than 300 mobile services that enable the citizen to obtain citizenry services using mobile phones. Stereotype of such services are social security services such as (1) personal account information, (2) SMS alerts for tax, (3) passport renewals and oversee trips, (4) notification for examination result for students, (5) Checking the latest traffic conditions for motorists, and (6) notification for receiving business license status.

There have been numerous mobile applications in Singapore. Some of them are SLA OneMap. This application is an integrated online platform for location-based services. It provides reliable, timely and accurate information by real-time. The next is SCDF's Mobile Phone Technology. SCDF is available iPhone and runs in IOS. It covers

essential emergency and fire safety, for non-iPhone users, they can turn to SCDF Ready Mobile that presents the emergency advisories in text and animation forms. The third is NEA, it is an application for providing real-time information on weather and receives push notification alerts when raining at certain locations in Singapore. The next service is PUB's SMS Alert. This application helps citizens who want to keep tabs on the water level in a canal or drain at a designated location, and OneService Mobile App. This application seems a gateway service where members of the public to give their feedback on municipal issues; this application is one of part for citizen-centric. Over 200 frequently requested statistics spanning across 27 data categories, including Population, Prices, Labor, Manufacturing, Services and International Trade are available for access via this mobile app. Users can personalize the order of the data categories according to your preference and save the changes for future launches.

### *1.2.2 South Korea*

In South Korea, there are over 86% of households are using the broadband internet, while 84.8% of the citizen use internet (2013), the number of mobile subscribers are 98% of the citizen.

Mobile government vision in Korea is to need the m-Government comprehensive strategic plan for Smarter, more Developed Government by minimizing trial and error, maximizing citizen satisfaction and developing government productivity.

In South Korea, the Korean government has strategic plan for m-Government where they focus on to (1) establish the Wireless Network Infrastructure for the whole country, (2) to transform Digital Government to Smartphone-based m-Government Services (transform the legacy Digital Government services to Integrated, simplified & connected mobile services-Provide the mobile gateway), (3) to find the way to solve the mobile issues, (4) to public database & services open to not only public sector but also to private sector, and (5) to establish the Mobile Service Center Construction.

### *1.2.3 Estonia*

According to Waseda Digital Government ranking, Estonia is a country which the development of ICT is very fast, not only in Digital Government activities but also the mobile application service to citizens. In 2013, Estonia has 80 percent of the population used the Internet until 2014 83 percent of households have internet capabilities. Especially, all Estonia schools are connected to the Internet.

In Estonia, the wireless access is cover in more than 1007 public places; some of them are free of charge. In 2015, 98 percent of transactions of a bank are conducted by online. In term of e-Tax, in 2015 Estonia has over 95 percent income tax is declared through the Internet.

In term of mobile services, mobile penetration is quite high in Estonia; the number of a contract of the mobile phone is more than 139 per 100 people. In Estonia, there has been a government service that allows the citizens to pay for car parking through a mobile phone. This service is one of the numerous mobile services in Estonia.

#### 1.2.4 USA

The U.S. Government's mobile efforts are led by the Office of Citizen Services and Innovative Technologies (OCSIT), which is a part of the General Services Administration (GSA). OCSIT runs the website [digital.gov.gov](http://digital.gov.gov), and its Mobile Program Management Office (Mobile PMO) provides tips, training, and tools for government agencies to provide more value to citizens. One major focus, especially since the beginning of the age of smartphones, has been to offer a range of mobile applications and services to provide support wherever people may go.

For example, citizens can download the Federal Emergency Management Agency's (FEMA) mobile application to receive information, tips, and instant emergency alerts directly from the agency. Users can also use the app to submit their disaster reports and photos using GPS technology.

U.S. Citizenship and Immigration Services (USCIS) recently announced testing for a mobile app version of their online employment status verification system - Verify. This federal system checks the immigration status of a prospective employee, and it is a required part of the hiring process in some states. The new mobile app offers the ability to use the built-in camera on the mobile device to send a photograph of the documentation for verification, simplifying the process.

The Department of State, the Department of Agriculture, the Census Bureau, the Internal Revenue Service, and many more departments and agencies offer applications for both Apple and Android smartphones. The Department of State's featured app is called Smart Traveler. It allows users to view visa requirements, relevant local laws, embassy and hospital locations, and travel warnings regarding various countries in a user-friendly manner. While all of this process for regular travelers and it provides SNS integration.

A recent OCSIT initiative was to establish the U.S. Digital Registry, along with an API (Application Program Interface) for end users. The Digital Registry is an official listing of all the social network accounts and mobile applications issued by the U.S. Government. This official listing is important because of a lot of copycat sites and accounts purporting to speak for the government. The registry will allow each platform to automatically verify the authenticity of a specific app or account. The implications for third-party mobile app developers are significant. For example, a developer could create an app that consolidates feeds from various government agencies (FEMA, the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service (NWS), etc.), and compile that information into a user-friendly and personalized feed.

The official Open Data site “Data.gov” continues to showcase third-party mobile applications that make use of open datasets available on the website. The range of applications that make use of these datasets include applications to find the cheapest gas stations, to monitor the effects of climate change, to check the source and nutritional information of food, to find information on local schools and universities, and much more. The sheer variety of third-party apps that make use of these data sets provides a good example of the importance of making government data open and available to the public.

## **2. AI and IoT for Digital Government**

### **2.1 Outline**

The concept “Internet of Things - IoT” appears recently and becomes a hot topic in the next ICT development. Since it was born, we should consider changing the definition of a PC. A new era of computer is open and shifts from desktop workstations to mobile phones and, now, to everyday objects, inspiring the term “Internet of Things.” where any device can be Internet-enabled, linking it to additional computing power and analytic capabilities that make it “smart.”

Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to the areas such as smart cities.

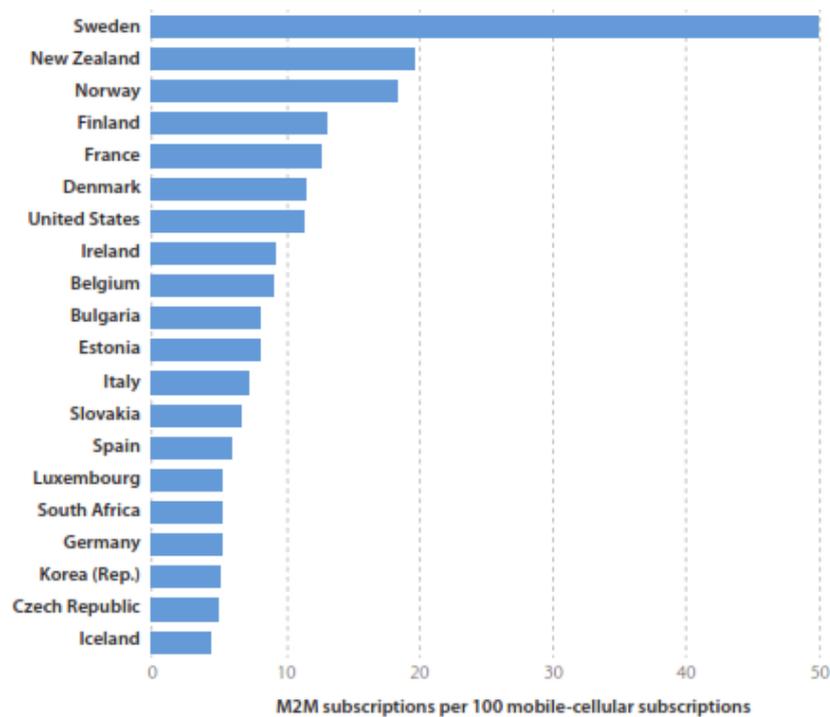
In term of delivering services, Digital Government has many practical contributions to citizens, however in many countries, especially for least developed countries and developing countries, the governments are difficult to spread services to all citizens due to lack of communications, connections, and end-users. With an application of IoT into Digital Government services, the government can solve this issue. With the ability to connect multiple devices, through different approaches, the government has the ability to expand services in order to be connected to make services better and more efficient government requirements. Applying IoT in the government operations enables the government to respond better and faster in the case of emergency (ex: early warning of natural disasters system, climate changes), deliver value to citizens, and making security a priority.

The Internet of Things offers new ways to make citizens smarter, more efficient and more informed – while, at the same time, delivering cost savings to the government. Connected infrastructure – from toll roads to parking places to utility meters – delivers

real-time “actionable” information around costs, condition, usage, and utilization to citizens and government alike. Citizens can instantaneously find parking or cut back on electricity usage, while government can allocate the right resources at the right time to charge fees, deliver services, and manage public infrastructure.

Furthermore, the IoT applications in public sector also reduce the operating costs, to help the government sharing data and reuse data among government agencies. Based on these activities, the governments build easily smart solutions to develop ICT as well as to create new services to citizens.

Artificial Intelligence (AI) application has been increasing in the last five years with the help of the rise of IoT and Big Data Analytic. These three newly terminologies in the ICT are enabling the institution to gain insight from any data available in the cloud as well as on premise. Insight-driven business becomes a new trend in research and ICT application not only for businesses but also for public sectors. AI helps organizations build smarter infrastructures by reducing investment costs, using analysis tools to optimize input, create stream information and sharing output data to use shared database inside organizations. It will provide a basis platform for decision-making processes and prediction of business results. To build flexibility system reduces the input load, and revolutionize the way we work with smart devices based on cloud computing. Therefore, it is a useful and indispensable tool for every organization.



**Figure 5: M2M subscriptions per 100 mobile-cellular subscriptions (Source: ITU)**

Based on available data, there were 22 mobile-cellular subscriptions for each machine-to-machine (M2M) subscription worldwide at the beginning of 2015. The

countries with the highest M2M penetration rates are highly industrialized, advanced economies, including the Northern European countries such as Sweden, Norway, Finland and Denmark (Source: ITU).

## **2.2 AI and IoT**

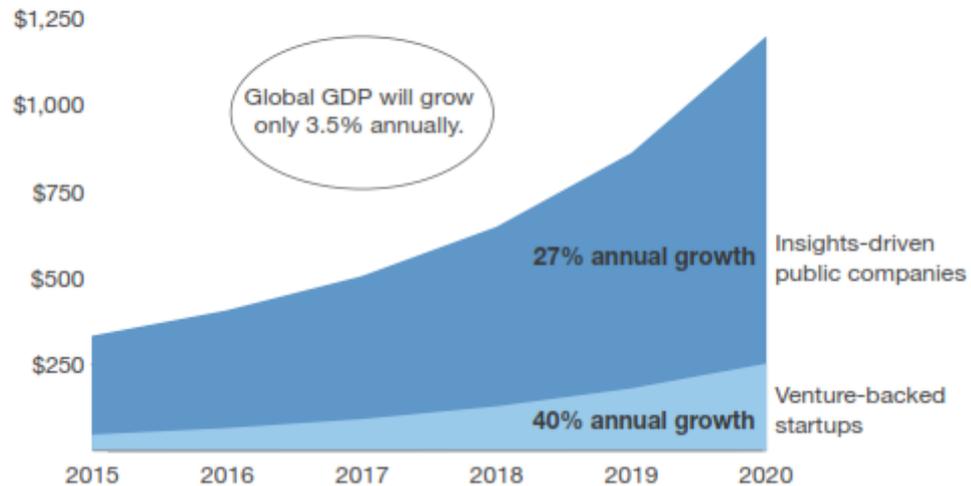
IoT has been referred as a concept where all devices can be connected to the Internet for sharing information among these connected devices thus maximizing the throughput of information transmission. According to IDC's research, IoT industry is projected to generate around \$ 6 trillion in 2025. In the public administration, IoT is remarkably effective if applied thoroughly. These include IoT applications in the public management such as Disaster Management and Emergency Management. In the Disaster management, sharing and transmission of information are crucial. In this issue, the government can fully control and prevent damage caused by implementing early warning systems, such as Tsunami warning, earthquake, or forest fire warning by setting up a sensory network and connect them to the Internet to control simultaneously synchronized data sharing among the government agencies.

One of the applications of IoT is to build smart cities. It can be seen as the most effective in implementing smart city. IoT applications that leverage ubiquitous connectivity, big data and analytics are enabling Smart City initiatives all over the world. These new applications introduce tremendous new capabilities such as the ability to remotely monitor, manage and control devices, and to create new insights and actionable information from massive streams of real-time data. IoT offerings are transforming cities by improving infrastructure, creating more efficient and cost-effective municipal services, enhancing public transportation, reducing traffic congestion, and keeping citizens safe and more engaged in the community.

In the application of Digital Government, e-Health is one of the services to be deployed. The applications and techniques in e-Health are increasing. IoT is one of the technologies that are essential in e-Health. The IoT application in healthcare, also is known as Internet of Medical Things (healthcare IoT). It is the collection of medical devices and applications that connect to healthcare IT systems through online computer networks. Medical devices equipped with Wi-Fi allow the machine-to-machine communication that is the basis of IoMT. IoMT devices link to cloud platforms on which captured data can be stored and analyzed. As is the case with the larger Internet of Things (IoT), there is now a possible application of IoMT than before because many consumer mobile devices are built with Near Field Communication (NFC) radio frequency identification (RFID) tags that allow the devices to share information with IT systems. The practice of using IoMT devices for remotely monitoring patients in their homes is commonly referred to the telemedicine.

By improving IoT in transportation, it helps many cities to have begun smart transportation initiatives to optimize their public transportation routes, create safer roads, reduce infrastructure costs, and alleviates traffic congestion as more people move into cities. For developing countries, IoT helps to solve a congestion of the traffic. Also, IoT enables rapid dissemination of information regarding the situation of road.

**Revenue forecast of insights-driven businesses**  
(\$ billions)



**Figure 6: Insights-Driven Businesses will steal \$1.2 trillion annually by 2020**  
(Source: Forrester, Economic Intelligence Unit, Morningstar, and PitchBook Data)

The figure above shows that AI will drive the insights revolution to all other data points is shown the estimation and prediction for 2017 (Source: Economic Intelligence Unit, Morningstar, and PitchBook Data). In 2017, these technologies will increase businesses’ access to data, broaden the types of data that can be analyzed, and raise the level of sophistication of the resulting insight.

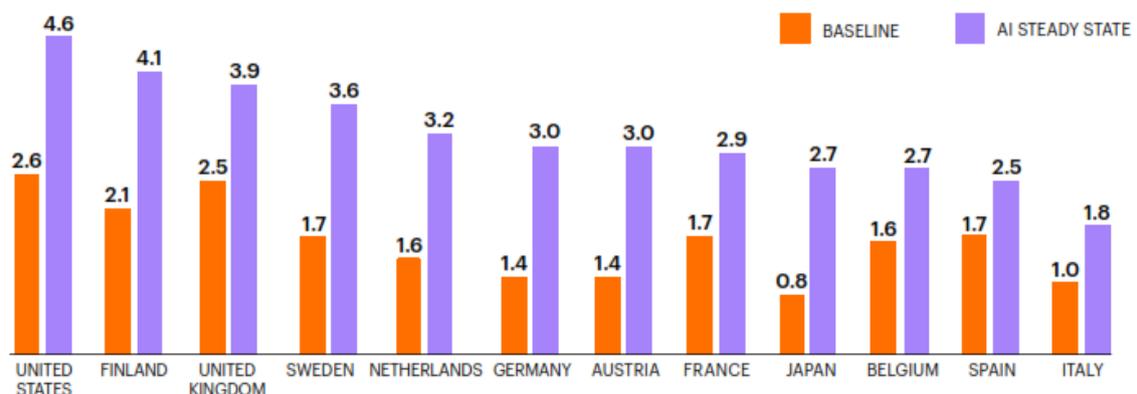
Nowadays, the application of ICT in daily activities is increasing significantly. It requires all organization and individual to understand and have perfect skill on using ICT application. Therefore, everyone has to strive to change and to improve their skills to meet the need of the requirement. With the IoT applications deeper in every field, IoT has created a new environment to promote and enhance the development of human resources.

One of the most applications of IoT is Web of Things - Government 3.0. Government 3.0 is a new paradigm for government operation to promote active sharing of public information and removal of barriers existing among government ministries for better collaboration. The ultimate goal is to secure the driving force for national administration and to provide personalized services to individual citizens, and at the same time, generating more jobs and supporting creative economy.

Mobility is no longer a technological revolution. It is more about how businesses and governments can provide a better social infrastructure through mobile applications and services. Adoption of mobility, therefore, is an indispensable asset for the public sector in meeting the demands of citizens. The Web of Things takes advantage of mobile devices' and sensors' ability to observe and monitor their environments, increasing the coordination between things in the real world and their counterparts on the Web. The Web of Things will produce large volumes of data related to the physical world, and intelligent solutions are required to enable connectivity, inter-networking, and relevance between the physical world and the corresponding digital world resources.

Government 3.0 pursues transparency of government. Open government regarding data and information means the transition from supply-driven transparency (reactive, responsive disclosure of public information) to demand-driven transparency (proactive sharing). Government 3.0 is intended to “make information sharing more equitable and transparent between the central government, local governments, government agencies and the public.”

For the Digital Government activities, AI application is to improve the efficiency of online services, which can help developing and least developed countries to catch up with developed countries, minimize digital divide, and facilitate connectivity. The use of AI in the public administration helps the state agencies to minimize the investment process through the use of a common database, increasing the efficiency of state management, and the transmission of services. For example, in Japan, the country with the number of aging people is very high; AI not only makes delivering services to citizens easier and faster but also helps elderly people to control the technology and easy to access new services. Also, AI is truly effective in managing disaster and directing people to a safe life. The figure below shows the economic impact of AI and it indicates that AI has the potential to double annual economic growth rates (percent)



**Figure 7: The Economic Impact of AI (Source: Accenture and Frontier Economics)**

### 2.3 Typical Example

### 2.3.1 *South Korea*

Korea has been a leader on this front. The Korean Government began to channel resources into laying a Digital Government foundation in the late 1970s. Through the Five National Computer Network project of the early 1980s, the Comprehensive Plan for Korea Information Infrastructure Establishment project, and the National Basic Information System project in the late 1980s, the Korean government established a high-speed communications network and stored vital government records—resident registration, real estate, and vehicle records—in a digital format. In the years 2000 and 2001, the use of information technology in the government expanded. The Special Committee for Digital Government set forth eleven major Digital Government initiatives within the same year. The term “Government 3.0” has garnered much attention from the public since the 2012 presidential election in Korea.

In 2013, the Korean government announced Government 3.0 as a new paradigm for Digital Government integration. The term Government 2.0 indicated the governmental use of Web 2.0 technologies because it represented the use of second-generation Web technologies in government. Government 3.0 in Korea takes this a step further. This new paradigm provides high-quality information and services customized to serve the unique needs of individuals with a wide array of topics including employment opportunities, weather, traffic, education, welfare, and finance. Government 3.0 even goes beyond the technological promise of Web 3.0. The Park Administration envisioned Government 3.0 as a means of ushering in a new age of hope and happiness for all Koreans. The Korean Government 3.0 initiative seeks to accomplish two high-level goals: providing services customized for and tailored to various needs and demands, and creating new jobs by discovering development engines. All these efforts are supported by the four core values of openness, sharing, communication, and collaboration.

### 2.3.2 *USA*

U.S. Government investment in Internet of Things (IoT) technology reached an all-time high last year and is expected to continue to grow in the years to come. In the fiscal year 2015, the federal government spent \$8.8 billion, an increase of more than \$1 billion compared to the previous year, and estimates for the years to show similar increases. A report from Business Intelligence, it estimates that there will be a total of 22.5 billion IoT devices by 2021, which suggests that the government will have a significant impetus to utilize this technology for official purposes. The public sector is already the second-largest adopter of IoT technologies, following private businesses. Still, many analysts believe that federal, state, and local governments are just beginning to tap into the potential benefits of IoT technologies.

The first and most important priority for IoT in government is to reduce costs and make governmental processes more efficient. One of the most basic ways to accomplish

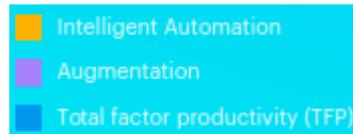
this is to install IoT-supported smart-building applications in government facilities, which is the aim of the General Services Administration's (GSA) Smart-Buildings initiative. Implemented in 2012, the project has so far installed sensors throughout nearly 100 energy-intensive government buildings. Simple motion detectors that shut off lights when no employee is nearby have been in place for years, but more sophisticated IoT-enabled devices are capable of detecting temperatures throughout the entire building and adjusting the climate control in the building accordingly. So far, the GSA estimates that \$15 million dollars is saved each year because of these programs.

Another important application of IoT is as a resource to collect and analyze massive amounts of user data. The National Aeronautics and Space Administration (NASA) is a governmental organization at the forefront of IoT Data research. The Administration is using satellite technology to analyze data cohesively collected from IoT-enabled devices. This IoT data could also be used to provide up-to-the-second analyses of massive amounts of data, available remotely via cloud computing. The goal of these new technologies is to maintain the United States' edge in IoT development (the majority of IoT companies were based in the United States as of 2016, even while it lags behind Singapore and other Asian and European countries regarding smart cities and other factors).

Though the potential benefits of IoT technology are manifold, the technology also comes with a great deal of risk. Already, privacy advocates are worried about the implications of IoT and the massive amounts of data available regarding civil liberties and personal privacy. The Director of U.S. National Intelligence, James Clapper, publicly announced that intelligence services might someday use IoT "for identification, surveillance, monitoring, location tracking, and targeting for recruitment, or gaining access to networks or user credentials." Many citizens and government officials alike find these new capabilities concerning, and the government has accordingly invested in making sure American IoT infrastructure stable and secure. These privacy and security concerns are also responsible for the relatively cautious approach to adoption witnessed in the government sector as compared with the private sector.



A strong entrepreneurial business climate and advanced infrastructure position the United States to benefit from the economic potential of AI. Accenture research estimates a significant increase in United States' GVA growth, from 2.6 percent to 4.6 percent in 2035. The situation explains an additional US\$8.3 trillion GVA in 2035—equivalent to today's combined GVA of Japan, Germany, and Sweden.



**Figure 8: AI impacts on National Economic Growth in the US (Source: Accenture)**

### 2.3.3 Singapore

AI is the trending tech topic of the year and Singapore's government. It aims to bring together government agencies, universities and institutes, investors, industry people, and startups to advance AI research, development, and practical use in Singapore.

AI.SG brings together six of the country's most prestigious government-related players: the National Research Foundation (NRF), the recently founded Smart Nation and Digital Government Office, the Economic Development Board, the Infocomm and Media Development Authority, SGInnovate, and healthcare IT firm Integrated Health Information Systems (IHiS). NRF said it would invest up to US\$107 million over the next five years in the project.

## 3. Smart City

### 3.1 Outline

This concept of implementing the ICT for regional development by improving the quality of life in certain areas has raised the attention of government, academia, and business enterprises. The use of new ICT concepts such as Internet-of-Things and Big Data is mandatory in developing the smart city.

A smart city is a concept associated with IoT, in the context of Digital Government services, it considers with the concept of e-governance. In the public administration, to build smart city projects, the government needs to consider the following key issues: (1)

Building broadband ICT infrastructure, (2) Using smart devices, (3) Developing Web-based application and e-Services, and (4) Open Government data.

The purpose of the Smart Cities is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to Smart outcomes. Area- based development will transform existing areas, including slums, into better-planned ones, thereby improving the livability of the whole City. New areas (green field) will be developed around cities in order to accommodate the expanding population in urban areas. Application of Smart Solutions will enable cities to use technology, information, and data to improve infrastructure and services. Comprehensive development in this way will improve the quality of life, create employment and enhance incomes for all, especially the poor and the disadvantaged, leading to inclusive Cities.

To build a smart city and associate it to the Digital Government services, the policymakers should consider the characteristics and features of the city. These features include building healthcare community through the promotion of e-health services, implementing e-education, developing mobile services for connectivity, accelerating and improving the efficiency of the use of energy with particular emphasis on green and clean energy sources. Furthermore, building digital communication and giving a solution for ICT innovation.

### **3.2 Smart City for Digital Government**

Smart cities revolve around the use of technology to deliver goods, reduce costs for service providers, and allow cities to be better managed. With smart cities, e-governance offers the opportunity for governments to make their management of cities more timely and beneficial to citizens mainly through the delivery of information and services.

### **3.3 Typical Example**

#### *3.3.1 China*

Over the past years, “Smart City” has become a hot topic spreading around Chinese society, from top policy-designing organizations to ambitious private industries. On August 2014, National Development and Reform Commission (NDRC) published the announcement named “Promoting Healthy Development of Smart City” to central departments and local government administrations. The announcement has comprised six sections and categorized into 15 specific sub-goals covering the items such as general city-planning-making, public services, social management systems, modern industrial development, intellectual infrastructure and protection, key information resource utilization and sharing, IOT application, Clouding-Computing, Big Data, information technologies integration, and cyber security. In the vein of “National neo-urbanization plan (2014-2020)”, “Promoting Internet+ Action” and “Promoting information consumption and domestic demand,” the announcement was vital for

leading public and private sectors stepping into Smart City. The basic consensus regarding necessary fields in that society should double. According to the announcement, a major group of smart cities should be established by 2020 to serve as a regional center that driving peripheral districts with a competitive advantage. The focus of the first group of center smart cities are mainly in four aspects: (1) Convenient public services including education/culture/health care/employment/social insurance/detection/transportation, etc. (2) Elaboration of city management. (3) Livable environment, and (4) Intelligent infrastructure, in accordance with the 15 sub-goals.

In the wave of developing the city into more “smart” way, local governments are enthusiastic to create a joint venture between the city and the private sector. There was report drawing the fancy and promising scene in a medium-sized city “Yinchuan” lays northwest part of the country, where “facial recognition” and “smart rubbish bins” are in a smart use. More commonly, private car drivers are passing in and out of parking lot without any process via automatic recognition camera scanning car itself, less and fewer people are carrying wallets, instead one mobile phone equipped with applications (Wechat, etc) to pay all the bills or pass identity authentication in the commercial and administrative course. New technologies are applied in the real daily life hastily in China than other nations, which enables citizens to adapt every detailed aspect of transformation of the smart city.

A progressive collaboration between local governments and the private corporation as mentioned above could be seen as a motivation for emerging technology application. Meanwhile, academia has made their moves to participate in the cooperation activities as well. Under the umbrella of top policy-making officials in instance Ministry of Industry and Information Technology of China (MITC), Ministry of Science and Technology of China (MSTC), Ministry of Housing and Urban-Rural Development (MOHURD). Committee, association, and think-tank regarding smart city issues are founded rapidly to support industrial development and the governmental decision by handing deliberative schemes from experienced experts. Smart City Conference and Exhibition have been held in China as well aiming to build an open platform for officials, industry, and academia. Also, the exhibition was enhanced the communication and strengthened innovative collaborations among various sectors. Even though it is a not a new thing, however, it has the latest merits attracting massive attendance internationally. After all, it’s one of the big event —may become the largest market all over the world in the future—that drives business excited and crazy which it is said that 500 smart cities are under designing and construction.

### *3.3.2 Indonesia*

During the last decades, many cities in Indonesia enthusiastically apply the concept of Smart City. These cities are willingly transforming from just a city to become a smart city. Leaders of these cities would like to create the city that listens and understand the

society. They acknowledged that Digital Government alone is not enough for improving the quality of life of the society. Among these cities that have established the smart city, the cities are the frequently introduced cities, both Bandung and Surabaya.

### **Bandung Smart City**

Luckily Bandung has a very good leadership in developing the smart city. Mayor of Bandung, Ridwan Kamil, perceives the smart city as the utilization of ICT to enable the city for connecting, controlling, and monitoring the situation in a city. Using these three components, a city would be able to improve the quality of public service delivery, the convenience of living in the city, and to improve a competitiveness of a city.

Bandung City has established the Bandung Command Center (BCC). In BCC, officers in Bandung City are able to monitor every pertinent object of Bandung City such as the location of operational vehicles, a report from citizens related to the infrastructure in Bandung City, and progress of project development. There are a lot of applications available for Bandung City's citizens. SOCA, GAMPIL, and Sabilulungan are some examples of applications that support the development of Bandung Smart City. Moreover, for improving the safety in Bandung City, there is an app named "Panic Button." Using this app, people who witness or experience a threat can push the button. The application will notify the nearest police station and local security (Satpol PP). The expectation of this app to reduce criminal acts in Bandung City is high.



**Picture 1. Bandung Command Center (Source: Bandung Local Government)**

Not only Smart Living, but Bandung City also introduces Smart Branding. Some initiatives under Smart Branding are the theme parks at every corner in Bandung City. Park for aging people, park for watching a movie together, and park for those who feel so lonely are some examples of these theme parks.

## **Surabaya Smart City**

Similar to Bandung City, Surabaya City has a very strong leadership from its mayor, Tri Rismaharini. Risma, a calling name of Mayor of Surabaya, started the development of Surabaya Smart City since 2002. At that time, she introduces the use of ICT in the city development. She enforces the ICT system to make the Surabaya City more responsive to the citizens' needs. Being responsive government is the foundation for building a smart city.

Surabaya City adopted four stages in its Smart City development. At the first stage, the project was focused on the technical installation. This stage includes the enhancement of internal government performance; Identification of Performance Indicator, Deployment of ICT Infrastructure, and Implementation of e-procurement. The second stage is the strengthening of social capital; citizens change management, building trust, and defining the solution for city problems. The third stage is the period of developing citizen-oriented applications such as e-health and e-toko (a small-scale e-commerce that promotes the products from the villages). The fourth stage is the enhancement of ICT-based that follows the concept of smart city.

## **Indonesia Smart Nation Award**

In 2015, Citiasia Center for Smart Nation (CCSN), conducted an assessment for measuring the aspects of Smart Region Readiness. Up to now, this assessment is the most comprehensive assessment in Indonesia since it covers 93 cities, 412 districts, and 34 provinces.

This assessment uses two indexes; Smart Region Readiness Index (SRRRI) and Smart Region Index (SRI). SRRRI uses five indicators "Nature, Structure, Infrastructure, Superstructure, and Culture". SRI uses six indicators "Smart Governance, Smart Branding, Smart Economy, Smart Living, Smart Society, and Smart Environment".

The top five cities in Smart Region Maturity Index are as follows:

- City level: Surabaya City, Bandung City, Semarang City, Bekasi City, Depok City
- District level: Bogor, Sleman, Tangerang, Bantul, Banyuwangi
- Province level: West Java, East Java, Central Java, DKI Jakarta, Bali

### *3.3.3 Smart Dubai*

Dubai is a city and emirate in the United Arab Emirates. It is located on the southeast coast of the Persian Gulf and is the capital of the Emirate of Dubai, one of the seven emirates that make up the nation. Dubai has 4 million residents, but they come from 180 countries. Dubai is known for the most ICT application in term of smart city and Digital Government activities in the Middle East. The Smart Dubai initiative,

formally undertaken in March 2014, aims to establish Dubai as the smartest city by 2017, driven by four key strategic pillars and spanning six dimensions classifying initiatives citywide. It was born out of the visionary approach of Sheikh Mohammed Bin Rashid to focus the city's unified effort towards its most valued asset - its people

The Smart Dubai focuses on six smart sectors (1) Mobility Infrastructure, (2) ICT, (3) Environment, (4) Governance, (5) Living, and (6) Economy. For each sector, Dubai government has some factors to identify and develop. In the smart mobility infrastructure, they develop health infrastructure, transport infra, piped water, sanitation, electricity, road infra, and building. In the development of ICT, they build network and access, services and platforms, information security and privacy, electromagnetic field. In the environment, they focus on developing in the fields of water, soil and noise, energy, CO2 emissions, and air quality. For the administration, they build smart governance by improving openness and public participation, social and gender equality, income consumption and equality. For a smart living, they have a plan for education, public safety security, and health. Furthermore, Dubai government is building the smart economy by improving innovation and knowledge economy.

The vision of the smart Dubai is to make Dubai the happiest city on earth, main dimensions of this strategy are to build economy, governance, and people. But at the local government level, they focus on living (exceptional quality of live, accessible education health care, culturally vibrant lifestyle) mobility (seamless, efficient transport of people and movement of ideas enabled by innovative infrastructure), and environment (sustainable technologies for the resource, population and asset management for sustainability).

One of the most prominent applications in building a smart city is to establish an open data platform. Dubai Data will stimulate a new data economy for the city, unlocking opportunities and ultimately enriching the quality of life for all Dubai stakeholders, including government departments, private organizations, investors, residents, and visitors. It has been built on collaboration and promoting cooperation and co-creation in both the operations and outcomes of the initiative. An inclusive process from inception, city stakeholders were engaged throughout the strategy and implementation process, with the aim to cultivate a culture of cross-sector sharing.

To build a smart city, the Dubai government created the new digital backbone platform with four pillars, six dimensions, 100 initiatives and in planning they will have 1000 smart services for citizens to 2020.

#### *3.3.4 United Kingdom*

The Manchester Smarter City Program has been developed to explore ways of making the city work better through the use of technologies. The program takes things that the city is already doing around transport, health, environment, and energy

efficiency and aims to encourage further investment, through supporting pilot projects and working with partners in the universities, business, and the public sector. Manchester Smarter City uses new technologies and ways of working to understand and optimize city systems to change how the city functions to improve how people live, work, play, move, learn and organize.

Manchester Smarter City focuses on six key themes to achieve better outcomes for the city and its citizens, and profiles those projects and places that are contributing to the Smart City. (1) Live, (2) Work, (3) Play, (4) Move, (5) Learn, and (6) Organize. To investigate the smart city in Manchester, in this report we will unveil some important factors which lead Manchester is one of the smartest city in the UK.

Open Data Manchester is one of the applications to make Manchester become a smart city. Thanks to this project, the government agencies can share and connect the data to others. It is very helpful in transportation control, weather information, and also e-services implementation. Open Data Manchester drives forward an open data ecosystem. Based on this project, the government is easy to develop city's innovation infrastructure and also create a lot of new services by using this platform and data.

SmartImpact is a network of cities. It is funded by the European Commission (<http://urbact.eu/smartimpact>) and led by Manchester City Council. It helps connect the city together through a backbone network. This network has now been connected more than ten cities in the Europe, includes Manchester City. One advantage of this network is to minimize the risk and barriers to investment in building a smart city. It enables cities to share the best apps for smart city development.

Centre for Digital Innovation (CDI) has been established as a response to the speed of change, bringing research, business, teaching and commercial activity under one roof. The CDI enable graduates to have an entrepreneurial approach and providing a space where SMEs, innovators and other can access the assets of the university, and work with early career professionals.

Intelligent Lighting: the aim of this project is to replace 56000 luminaries (light units) to enable LED street lighting. It uses a centrally operated system using dedicated wifi, each luminary uses a light array offering a wide spread of light on the "cool white" spectrum for residential /traffic areas and "neutral white" in the city center. By applying this project, the Manchester City reduces 60% of current £3.6m revenue costs in addition to a projected forecast of 4% increase in the cost of electricity and reduction of carbon output to 8K tones.

CityVerve: The CityVerve Project brings together the latest Internet of Things (IoT) technologies, deployed at city scale to deliver transformative benefits: new business and jobs for Manchester; better healthcare, transport, and education; safer streets; and more engaged and empowered citizens. It was established in July 2016 with a two-year remit

to demonstrate the capability of IoT applications and address barriers to deploying smart cities, such as city governance, network security, user trust and adoption, interoperability, scalability and justifying the investment. Combining technology and business model innovations, it will create a real-life blueprint for smart cities worldwide.

### 3.3.5 *Germany*

Berlin is known as the place of effective ICT application and most extensive compared to other cities. The ICT applications and deployment for smart city in Berlin is implemented uniformly across at all sectors and government agencies as well as with the participation of private sectors. To build Berlin become a smart city, the Berlin government has also implemented a strategic framework at central government level and also presented a lot of smart solutions such as smart administration and urban society, smart housing, smart economy, smart mobility, smart infrastructure, and public safety.

Smart administration and urban safety: In Germany, the structure of government is divided into three levels: central government, regional government, and local government. To deploy smart city in each region or city, it requires the governments need to apply ICT in daily administration. Therefore, in Berlin, the government has a plan to speed up and simplify administrative processes. This process optimization and automated control in closed systems of administration support human decision-making.

Smart services are, thanks to unified and standardized operating concepts, simple to use, familiar, easy to find, secure and certified. The government applies ICT in many fields of administration such as the progressive digitalization of business processes by creating a framework for the development of Digital Government within Berlin's administration for the years 2015 – 2017. Furthermore, they introduced Digital Government law. The law aims to establish basic Digital Government norms which will be able to help overcome the major obstacles created by the formal requirements of administrative law. Besides that, they encourage the online participation of urban society by creating a new platform ([mein.berlin.de](http://mein.berlin.de)) for introducing e-services to citizens. The Berlin Senate officially approved the “One Stop City Berlin 2016” program which services thematically, harmonizing business processes and increasing the number of ways to access administrative services. In 2016, the government introduced the modernization program “Service City Berlin 2016” for aiming to achieve the goal of making Berlin's administration more business- and citizen-friendly, transparent, participatory and efficient. Especially, the government introduced “Open data” ([www.daten.berlin.de](http://www.daten.berlin.de)) for free access and getting data. One of the most important solutions is they introduced smart leadership and smart staff. It means, they need to change themselves first, and then apply it to citizens and businesses.

Smart housing, smart economy, and smart infrastructure: one of the solutions to develop the smart city in Berlin is to develop smart infrastructure together with building smart mobility, and smart economy. This is the indispensable overall element in the smart city. For building a smart city, we need to have a strong telecommunications infrastructure at the first place. Next, the ability to expand, such as the deployment of sustainable systems, recycling management, Sustainable and climate-compatible energy supply, uncoupling higher performance and higher energy consumption in technology such as volumes of data, and also the speed and storage capacity of computers.

The innovation of economy is also attached to the development of the smart city in Berlin. Berlin has also improved the economy to conform to the current requirements, as well as in building a smart city. The reforms mentioned is the creation of an enabling environment to promote the social factors involved in the reform processes, such as to improve skilled workers, create a smart forum, internationalization, to make international cooperation, and political changes.

Public safety: The term public safety in Smart City Berlin includes both protection against intentionally caused damage and protection against natural disasters. This concept related to data infrastructure, smart grids, and cyber security. The availability of an Internet infrastructure in all areas of the city is one of the preconditions of having a Smart City Berlin. Key security aspects are the integrity and authenticity of data, and the availability of data even at times of crisis. These aspects have to be considered from the perspective of the public, providers, the authorities and also organizations entrusted with security responsibilities.

## **4. Cloud Computing Technology and Digital Government**

### **4.1 Outline**

As we all know, the benefits of cloud services are undisputed. All applications and platforms are considered services. It helps the institution reduce costs in the investment process, creating a consistent system from network, application, software, and to management tools. Cloud also helps organizations provide data, and sharing them through the network environment quickly and conveniently. Support for making data usage more efficient by sharing across organizations in the same organization, especially to Digital Government. It facilitates the connection and communication between the central government and local government is much more effective.

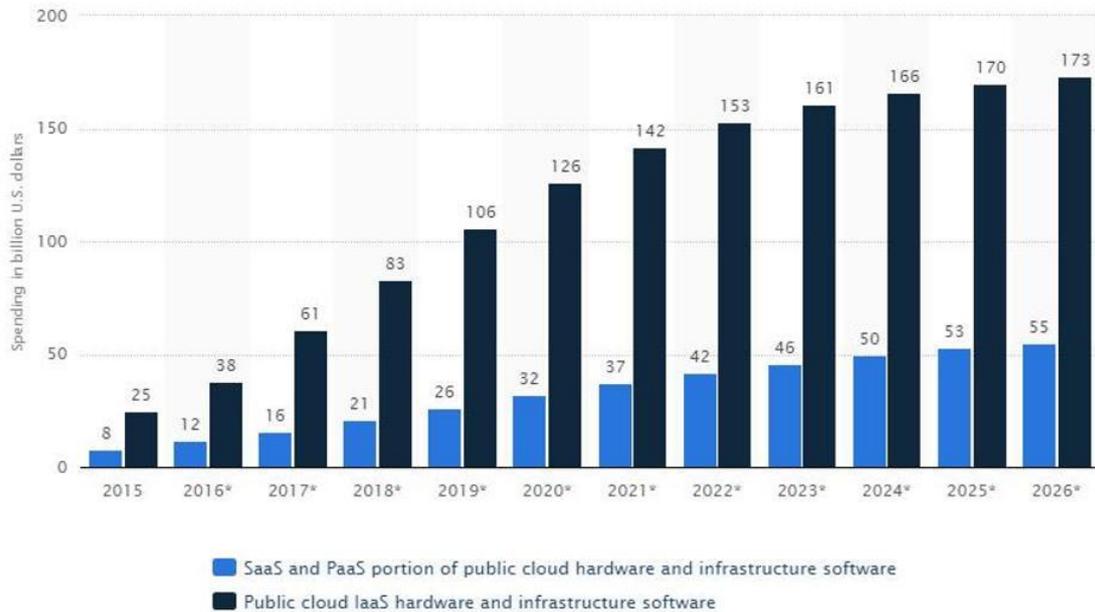
For the services that the government provides, in order to make full use of the efficiency, some benefits that Cloud brings to the government, especially with Digital Government services such as (1) Share data quickly and conveniently, while helping government agencies share the database, (2) Reduce investment, maintenance, technical maintenance costs, and invest in hardware and software systems in these organizations,

(3) Cloud also helps to manage the focus easier, (4) Increased security, and (5) Contribute to the development of new technologies such as Green ICT.

Digital Government automatically provides an integrated management with cloud computing by solving resolution problems and helps to reduce the budget based on the actual use of the data. The cloud architecture can help the government to reduce repetitive operations and increase the effective use of resources, in the global arena. These matters in their turn have an effective aid to create a green government, reduce pollution and waste management. Currently, companies and small businesses are using the benefits of cloud based on the pay-as-you-use service model, which is available on a wide scale. Effective challenges in Digital Government are classified into three groups that include social, economic and political barriers. These barriers limit the scope of policymakers' activity for effective use of new technologies. There are number of technical challenges such as data scaling, auditing, and logging, replication and migration, disaster recovery, management policies, system integration, legacy software, Obsoleted technologies and migration to new technologies. Cloud computing is appropriate to respond to these challenges. Cloud Database provides on-demand and high scalability which holds a large number of records that is the basic need in government. Cloud provides the ability to audit event, login and report information about the tenant and based on a program which recognizes fraud and corruption in government agencies. Such features can help in creating mechanisms for security incensement. Reliable and accessible applications can be created. Facilitate proliferation and migration of applications is possible with virtualization technologies in the cloud, which is useful in disaster recovery and reduction of time to establish new software. Cloud provides tools and technology which simplifies and eases the disaster recovery.

In 2016, spending on public cloud Infrastructure as a Service hardware and software is forecast to reach \$38B, growing to \$173B in 2026. Both SaaS and PaaS portions of cloud hardware and infrastructure software spending are projected to reach \$12B in 2016, growing to \$55B in 2026. The following figure provides an overview of spending on public cloud infrastructure worldwide from 2015 to 2026.

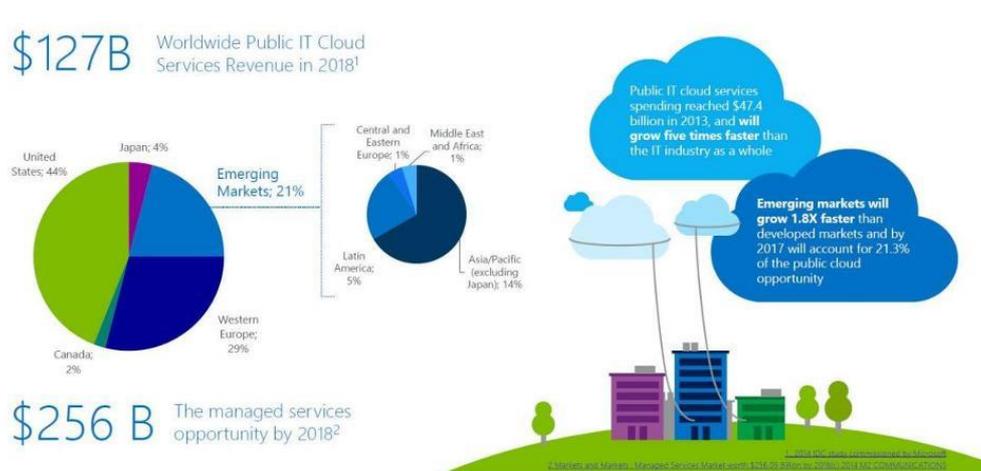
**Public cloud Infrastructure as a Service (IaaS) hardware and software spending from 2015 to 2026, by segment (in billion U.S. dollars)**



© Statista 2016

**Figure 9: Public Cloud Infrastructure as a Service (Source: Statistica 2016)**

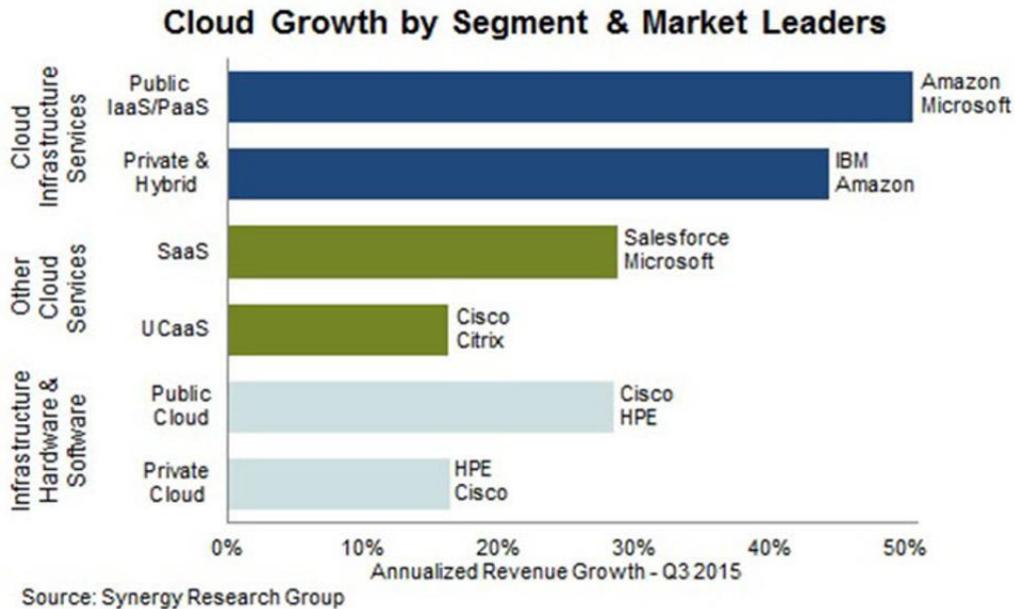
Worldwide Public IT Cloud Service Revenue in 2018 is predicted to be \$127B. Managed Services is projected to reach \$256B by 2018. Emerging markets are predicted to be 21% of the Worldwide Public IT Cloud Services market by 2018 (Source: Statistica 2016)



**Figure 10: Worldwide Public IT Cloud Service Revenue (Source: Microsoft Cloud Landscape Update, 2015, (RHP))**

The worldwide cloud computing market grew 28% to \$110B in revenues in 2015. Synergy Research Group found that public IaaS/PaaS services attained the highest

growth rate of 51%, followed by private & hybrid cloud infrastructure services at 45%. The Figure 12 below compares cloud growth by segment and market leaders.



**Figure 11: Cloud Growth by Segment (Source: Synergy Research Group)**

#### 4.2 The application of Cloud Computing in Digital Government Activities

The most significant cloud computing opportunities for the public sector may arise at the multi-agency or all-of-government levels. Around the world, public sector information management is clearly dominated by a “silo” model that sees most government organizations operating largely stand-alone information systems. One of the more intractable challenges faced by governments has been effective sharing of information technology resources. This is true in core Digital Government programs, and in areas such as public health/education and public safety/security. Governments have invested enormous effort into tackling this challenge over the past decade. For example, they have developed coordination mechanisms such as enterprise architectures and interoperability frameworks. They have also enacted laws, policies, and budgetary frameworks geared toward shared services and implemented a wide range of multi-agency ICT assets. Despite all this effort and cost, however, progress toward shared services has generally been slower and less widespread than many in government had hoped. As a result, governments pay too much for ICT and realize fewer benefits than they could—especially in regard to the performance of the public sector as a whole.

Cloud computing will deliver benefits beyond the public sectors of developed countries. Its advantages may be even more pronounced in developing countries that have not yet achieved high levels of public sector computerization, have lack of people with adequate ICT skills, or do not have firm legal or cultural requirements regarding data security and privacy. On the positive side, developing countries face less of the

entrenched resistance to new computing paradigms that government agencies in developed countries often exhibit. Cloud computing may enable them to leapfrog a whole generation of government computing, bypassing many of the costly and debilitating challenges.

### **4.3 Typical Example**

#### *4.3.1 USA*

The United States government believes the security of computer systems is important to the world for two reasons. The increased role of Information Technology (IT) and the growth of the e-Commerce sector, have made cybersecurity essential to the economy. Also, cyber-security is vital to the operation of safety-critical systems, such as emergency response, and to the protection of infrastructure systems, such as the national power grid. Based on then-DHS Secretary Janet Napolitano's testimony to the Senate in 2012, in 2011 alone, the DHS U.S. Computer Emergency Readiness Team (US-CERT) received more than 100,000 incident reports and released more than 5,000 actionable cybersecurity alerts and information products. The Twitter, the Wall Street Journal, New York Times, and the Department of Energy and many other prominent companies have reported that their systems had been breached. Furthermore, classified government data has been leaked to the press and the public in several high-profile cases. Current efforts are being made to secure sensitive data to prevent future breaches.

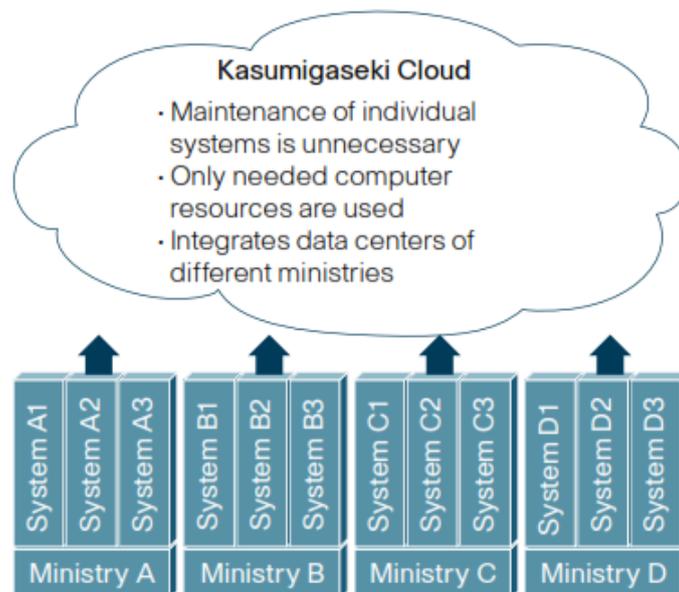
[www.usa.gov](http://www.usa.gov) is the U.S. Government's Web portal for citizens. It presents a wide range of information resources and online services from various government sources, accessible from a single point. It is also known as the National Portal of the USA and is a gateway to improving the communication experience between the government and the public. Moreover, it provides information that helps the public to have a better understanding of the government structure. The well-organized portal serves as a platform that assists the public to find desired information. To improve users' browsing experience, the portal also allows users to create government accounts that allow each individual user to customize the portal as they desire. The website contains accessibility features, a live chat platform, and the chat hours operation services are conveniently available every weekday except holidays. The website technology offers the opportunity for government institution to provide a one-stop-shop for all government information and services. It comprehensively lists all public services, forms, tools and transactions that the government provides in a user-friendly manner.

United States first federal Chief Information Officer (CIO) to migrate to the clouds was selected for the following considerations (1) The cloud computing platform's flexibility: the benefit of paying for a baseline capacity for normal traffic periods, but it can accommodate large traffic when needed and save cost when it's not being used. (2) Minimal time for migration: because of the provided services sensitivity. It needs the

minimum time to complete the migration. The actual migration process took 10 days only, while the test validation occurred in one week. (3) Additional security elements: all the security requirements for the website administration are met such as multifactor authentication (MFA) to access the portal, packet flow analysis, 128-bit encryption for traffic, and resource tracking. Furthermore, according to the Ministry of Defense standards; a special data center has been built to meet the security specifications of the physical building.

#### 4.3.2 Japan

Japan has a strategy to develop public services on the cloud computing platform very early. In 2010, the cloud-based service market will reach \$ 4.5 billion, by 2015; this number will increase more than six times, and is forecast to continue growing in the coming years. Also in 2015, the Japanese government has developed a strategy to promote the development of intelligent services on the Cloud platform. To develop this strategy, the government has focused on developing the Utilization Strategy, Utilization Strategy, Technology Strategy, and International Strategy. To promote Cloud services in the Government, the Japanese government introduced “Kasumigaseki Cloud” & “Local Government Cloud”, which supports all government ICT systems and has played a prominent role in growing Japan’s cloud market. This cloud has enabled public and private sector collaboration on processing government documents and included increased online applications to encourage public use of mobile devices to access government functions.



Source: Ministry of Internal Affairs and Communications, Japan, 2009

**Figure 12: The Kasumigaseki Cloud (Source: MIC Japan 2009)**

The Kasumigaseki Cloud will allow for greater information and resource sharing and promote more standardization and consolidation in the government's IT resources. By consolidating all governmental ICT under a single cloud infrastructure, the Japanese government believes it will see not just reduced costs and operational benefits, but more "green," environmentally friendly ICT operations. The Kasumigaseki Cloud is part of the Digital Japan Creation Project. This represents a governmental effort aimed at using IT investments (valued at just fewer than 100 trillion yen) to help spur economic recovery by creating several hundred thousand new ICT jobs in the next few years and doubling the size of Japan's ICT market by 2020. The MIC believes that "accelerating the use of ICT nationwide will require the government to take the initiative in implementing measures," and that the national government's promotion on cloud computing will not just help spur ICT development, but to help diminish the digital divide in that country.

#### 4.3.3 *Singapore*

As leading country in Digital Government area, Singapore would not pass up the chance to introduce and apply emerging technologies in public sectors. Public projects within Cloud computing, big data, and IOT utilization are ongoing or planned in sophisticated phases. Organizational preparedness such as National Cloud Computing – Advisory Council (NCCAC) is paying attention to the adoption of technologies, standard industrial construction and fostering collaboration between different sectors. Great potential in the development of emerging technologies into Digital Government area could be anticipated, but government' guidance should play the crucial role in leading industry and society.

The Singapore Government acknowledges that each cloud computing model provides its own level of assurance and benefits. As such, the cloud strategy for Singapore Government is to leverage the appropriate cloud for the appropriate need by adopting a multi-prong approach to cloud computing as follows (1) Leverage commercially-available public cloud offerings for appropriate needs<sup>1</sup> so as to benefit from lower cost of computing resources. (2) Implement a private government cloud (G-Cloud) for whole-of-government use where security and governance requirements cannot be met by public clouds. (3) Enable interoperability between G-Cloud and agency Clouds<sup>2</sup> through a set of internal G-Cloud standards.

G-Cloud is the next generation whole-of-government infrastructure. It will provide efficient, scalable and resilient cloud computing resources and will be designed to meet different levels of security and governance requirements. To further aggregate the whole-of-government demand to maximize cost savings to the Government, the Government will identify and provide Software-as-a-Service offerings, such as business analytics, customer relationship management, and web content management. G-Cloud

enables standardization, and sharing of computing resources and applications at the whole-of-government level, thereby generating cost savings to the Government.

#### *4.3.4 Thailand*

Government Cloud, also known as G-Cloud, is an infrastructure component with shared resources developed by the Electronic Government Agency (Public Organization) (EGA). The development of Cloud technology will be provided by several government agencies, where sources of information will be stored on the Internet. As G-Cloud can run remotely over the network, the size of the program is adjustable depending on users' specific requirements, with effective resource allocation, high security, and enhanced administration. G-Cloud offers a broad range of benefits to various IT-based services, where government personnel can generate greater working performance to ensure the highest quality of public services for everyone.

G-Cloud provides services based on actual requirements, where resources will be arranged according to different demands of users including virtual servers, operating systems, memory units, and central processing units. A team of technicians will be available for services 24 hours-a-day on a daily basis, whereby people will always be offered quality public services. The Cloud Computing system is highly secure and is developed for government organizations only, where the Service-Level Agreement (SLA) is not less than 99.5 percent. The system will certainly help reduce redundancy of investments varying in equipment, servers, server devices, and data centers. The system can be accessed via GIN and the Internet. The system can support all types of Cloud programs developed by the EGA to facilitate fundamental public services provided by the central government.

#### *4.3.5 Germany*

Cloud computing is one of the main pillars of the ICT strategy of the German Federal Government. This strategy has been published by the Federal Ministry of Economics and Technology in 2010 and aims at the digital future in Germany until 2015. Focusing on cloud computing, the objective is to facilitate and foster the development and installation of cloud computing services. In particular, both small- and medium-sized enterprises and the public sector should take advantage of cloud computing as fast as possible. The challenges (e.g. data security, quality assurance, easy integration, open standard, etc.), which need to be addressed for adopting cloud computing in Germany, are targeted in the so-called Cloud Computing Action Programme. These challenges particularly arise when adapting existing IT concepts to the specific requirements of cloud computing.

The Federal Government is pursuing to boost up the development and introduction of cloud computing facilities by issuing the new Cloud Computing Action Programme. There is a research project known as THESEUS, aiming to utilize The Internet of

Services and the Internet of Things. With this project, the German Federal Government is seeking to utilize semantic technologies and the creating new standards for the Internet of Services.

#### *4.3.6 Denmark*

The Local Government Denmark started discussions on using cloud computing in the public sector already in early 2009. Moreover, according to KPMG, Denmark is one of the leading countries regarding the adoption of cloud computing in the public sector. For instance, in 2011 a Danish municipality planned to use Google Apps Services such as calendar or e-mail in their school systems. In addition, a Danish procurement organization of a Danish municipality moved procurement services into the cloud already in 2011. Although Denmark still struggles with security and privacy issues, the Danish Data Protection Agency e.g. judged the cloud service of Microsoft - Office 365 - to be compliant with the EU and Danish legislations. In addition, cloud.dk offers public cloud services fully compliant with the Danish data legislation.

## **5. ICT for Anti-corruption**

### **5.1 Outline**

Corruption is not a new phenomenon in the world. It has existed since ancient times. The Roman Empire collapsed because of the massive corruption among Roman officers in the 5th century. They lived a luxurious lifestyle while the Empire was running out the money (MacMullen, 1990). Corruption also existed in the long history of Egypt Dynasty. The Nineteenth Dynasty of Egypt (ca. 1307 – 1196 BCE) is a period in which corruption became massive and notable (Kamel, 2008). In China during the Qin Dynasty, most of the imperial officers expected payback and accepted bribery from citizens because their remuneration was very poor (Fairbank, 1986). In Japan, during the Keitai Tenno or the reign of Emperor Keitai, there was a case of bribery involving a Japanese leader named Otomo-no-Omuraji Kanamura and Kudura from Korean Peninsula. Kudura expected the Japanese leader to give four districts controlled by Japanese Court, Yamato (Shiobara, 2013). These examples show that corruption may hamper the progress of a nation. The type of corruption that was common in the ancient or pre-modern era was mainly bribery, kickbacks, and embezzlement.

A corruption scheme has proven difficult due to its behavior, which is unseen for the purpose of direct, unbiased, and measurable observation (Andvig, Fjeldstad, Amundsen, & Soreide, 2001). Corruption activities involve two parties where one party has a power of resource allocation while another is the potential receiver of such resource, resulting in the use of public facilities for private gain (Macrae, 1982). Corruption harms most government institutions due to the fact that government officials and politicians are self-maximizers. They work together to establish their interests by maintaining and controlling regulations (Cheung, 2007).

Despite the complexity of uncovering the corruption, there are two reputable organizations consistently measuring the corruption around the globe. They are World Bank with its World Governance Index (WGI), and Transparency International with its Corruption Perception Index (CPI). Although the Indexes came from different institutions, different method, and different measure, these correlations between these indexes are high.

Taking from these two attempts of measuring corruption, there are two pillars for designing and implementing the anti-corruption. These two pillars are transparency and accountability. Transparency alone is not enough. It should be paired by Accountability. Both transparency and accountability are termed with the word “interaction.”

## **5.2 Digital Government as a Platform for Transparency and Accountability**

Transparency in government is commonly acknowledged as the level of how much information of an institution being published to the public without any restriction. The more transparent the organization, the more open it is to the public. Along with the spirit of the Freedom of Information, Digital Government helps government for improving the transparency. Accountability, on another side, is the ability of government to answer public inquiries regarding government’s performance and government’s code of conduct. Digital Government helps government institutions to gather and to respond public inquiries and opinion in a quick manner.

Combining the transparency and accountability in the interaction of government with stakeholders, Digital Government strengthens the monitoring capacity of government on its activities. Digital Government converts three interactions of government; interaction with citizens (G2C), with business enterprises (G2B), and with other government agencies (G2G), into a monitoring channel.

Among these three interactions, G2G is the most challenging for the government to implement. While G2C and G2B tend to grow on the supply and demand basis, G2G is more complex. G2G connects institutions that have authority, has money, and has discretion. In G2B, the government may choose a certain company to work with. For example, in e-procurement, the government allows only companies with tax clearance to participate in procurement. In e-tax, the government requires a company to register before using the e-tax. Unlike in G2B, a government institution cannot choose other government institutions to join in G2G. Political-will and institutional strength are more intense in G2G arrangement than in G2B or G2C. If one institutional has more power than other institutions, it can push the other to join the G2G. For example, Ministry of Finance has the authority to approve the annual budget of other ministries. As a consequence, if Ministry of Finance proposed a G2G application for budgetary management to all ministries, they have to support and accept such system. However, if

an institution has no superior to other institutions, it is more difficult to ask other institution to participate in its G2G. For example, Ministry of Agriculture and Forestry would like to control the commodity stock in all provinces and invite all provincial office to participate in G2G for sharing the relevant information. Unless there is a good political-will in local government, such G2G will not be successful.

### **5.3 Typical example of using Digital Government for reducing corruption, Indonesia, Japan, South Korea, and China**

The common Digital Government system for reducing corruption is e-procurement in G2B and e-services in G2C. Most government institutions build e-procurement in order to support fairness, to reduce asymmetric information, and to eliminate unethical discussion between government and the vendor. Since all information related to the government procurement is announced through one channel, all bidders have the equal information and are treated without any discrimination. Most countries in Waseda ranking have implemented e-procurement for various reasons. Although some of them have a very simple e-procurement system, the ultimate goal of it is to reduce corruption in government procurement.

The next is G2C. Unlike the e-procurement in G2B, which is considerably uniform in many countries, the implementation of G2C for reducing corruption is slightly differed among countries. Culture, regional development prioritization, and national development plan contribute to the style of G2C implementation in a country. One example of G2C implementation for reducing corruption is the implementation of Online Procedure for Enhancing the Public Service (OPEN) System in South Korea. Korean citizens perceived that the implementation of the OPEN system reduced the frequency of corruption compared to the period before the implementation of OPEN. In addition, most scholars agreed that the OPEN System is considered a success story of Digital Government in combating corruption. However, the system should be enforced through strong regulations, and strong leadership is necessary as the ultimate sponsorship for such an initiative. Another example of G2C implementation for reducing corruption comes from India through BHOOMI System. BHOOMI has enabled the citizens to access records of land mutation requests online. Having access to such information, a citizen can trace the progress of the land mutation process, thus eliminating the room for the discretion of public officials, which is one of the sources of corruption.

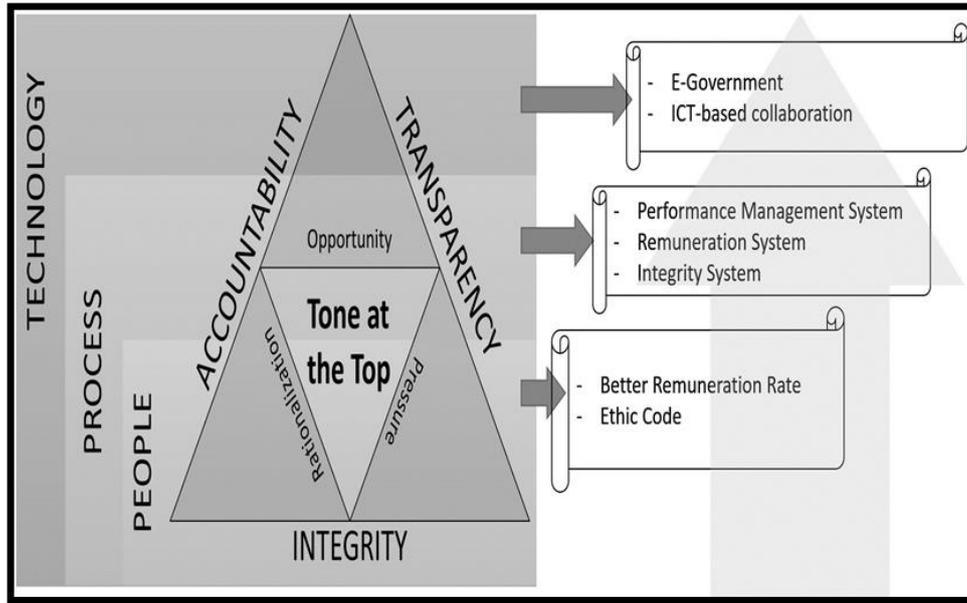
Under the track of implementing G2G for reducing corruption, there are two approaches to promote G2G as a way of reducing corruption. The first approach is G2G as the integration in which one government institution integrated the internal government system such as integrating the Human Resource Information System with Financial Information System. The ultimate goal of this approach is to support fairness in individual performance measurement, thus, achieving fairness in reward and

punishment system. Such systems are easy to find in developed countries and some developing countries. The second approach is G2G as the collaboration between one government institution with other government institutions such between Directorate of Customs and Excise and Ministry of Trade. This approach is more challenging than the former approach. The first approach can be accomplished using either top-down or bottom-up approach while the second approach requires political agreement. Good examples of G2G implementation are from the cases in Supreme Audit Institution (SAI) in Japan and Indonesia.

Both SAI Indonesia and Japan have utilized ICT for supporting their audit activities to be more effective and more efficient. In general, the use of ICT in SAI is predominantly for collecting the financial data electronically from government agencies. Both SAIs have performed an ICT-based collaborative work with other government agencies to simplify one part of their business process; collecting data for audit purposes. SAI Japan uses Certification of the Final Account Computer System (CEFIAN) since 1978 for accepting financial transaction electronically related to government revenue and expenditure as required by audit law and for checking the accuracy of such transaction in term of the transaction amount. The similar scenario applies to SAI Indonesia on e-Audit system except on the legal aspect. E-Audit has commenced its formal operationalization in 2011. SAI Japan created CEFIAN due to the mandatory of government agencies to submit electronic financial information to SAI Japan while SAI Indonesia created e-Audit due to the need of strengthening SAI's capability on monitoring government financial transaction. During the period of investigation, CEFIAN has shifted the role in combating corruption, from a corruption detection tool to a prevention tool. E-Audit, on another side, is still a tool for detecting corruption. The creation of e-Audit and CEFIAN increases the transparency level among government agencies to SAI. A certain level of transparency may enhance the traceability of the transaction. These systems enable one government agencies to find out other government financial transactions. The typical cross-validate across multiple entities through the G2G increases the cost of corruption.

In addition to the role of Digital Government in combating corruption through government interaction with stakeholders, there have been acknowledged that e-participation can take an important role in combating corruption. A case of the use of Weibo for reporting any indications of Chinese government officers' misconduct has indicated the rise of the social network as an auxiliary tool for combating corruption.

The figure 14 summarizes the anti-corruption pattern extracted from the anti-corruption strategy in country level.



**Figure 13: Anti-Corruption Platform (Source: Author)**

## 5.4 Conclusion

Finally, the experience of countries in combating corruption using Digital Government has uncovered a proper way for developing Digital Government that addresses corruption in a government institution. Takeaway of this Digital Government ranking suggests each interaction should come with the following value

- Participatory over Substantial Information in Government-to-Citizen
  - Fairness over Trust in Government-to-Business
  - Pattern Identification over Information Seeking in Government-to-Government.
- These three statements mean that while there is value in the items on the right, the government should value the items on the left more.

## VII. Methodology

### 1. Formulation

To evaluate D-Government development in a country, this ranking survey is based on a group of sub-indicators to evaluate the overall D-Government development in a country, ranging from policy development and e-Services implementation to management optimization and D-Government promotion. To improve the evaluation of D-Government development in a country, from 2010, the ranking added an e-participation indicator. In 2014, Open Government Data and Cyber Security were also added to the ranking. In the 2017 ranking survey, the research team added “the usage of emerging ICT technologies”. It makes the total 10 main indicators for evaluation.

To increase the quality, the assessment used a questionnaire as a tool to obtain some information from respondents who reside in the respected countries. The respondents are government officers who work for a ministry that concerns D-Government and, to some extent, respondents from academia who are knowledgeable in D-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 diagram shows the due process of creating the ranking.

Waseda-IAC International D-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).

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

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

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

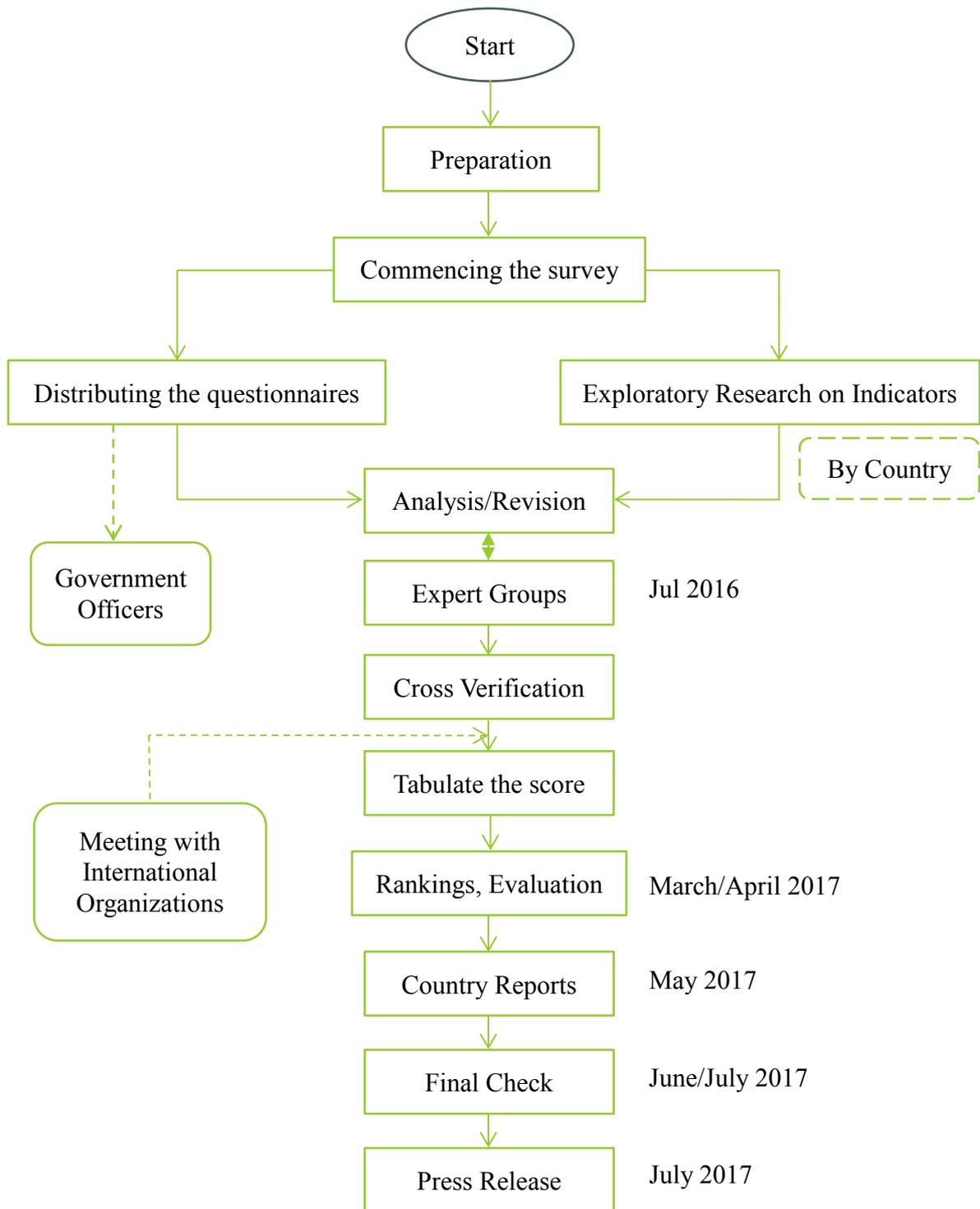
This will generate the Normalized Score which ranges 0 – 100. Furthermore, the Normalized Score is recalculated by weighted rate. The result is the released score that will be used as the source for arranging the rank.

No	Indicators	2017
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	D-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 D-Government (EMG)	NormScore X 8%

**Table 14: List of main Indicators**

## 2. Process of Evaluation

The rankings are prepared by the following process. As annual survey, it takes almost one year round for preparing both the ranking and country reports with 65 nations.



**Figure 14: Process Diagram**

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