

Rethinking Open Data in E-Government in Korea: An Analysis of the Utilization Gap

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Abstract The utilization of Open Government Data (OGD) is far more than a technical issue. On the one hand, the degree of utilization can be decided by information, system, and service quality. On the other hand, it is critical to the response of suppliers and demanders of OGD. Hence, the question “where does the ‘utilization gap’ come from?” is seemingly simple, yet the systematic evaluation of the utilization gap is a daunting task. This paper attempts to provide a holistic framework for evaluating the utilization gap of OGD in Korea and use it to diagnose the current status of OGD utilization, mainly focusing on the adoption of Open API. According to our analysis, Open API is a promising technique for improving the accessibility and utilization of OGD, but only a limited number of technicians in the supply-side and the demand-side use it for value creation and policymaking. This paper proposes some policy recommendations, especially emphasizing the issue of standardization, training of users, collaborations, and active feedback channels to narrow the utilization gap.

Keywords Open Government Data · Open API · Utilization gap · Public Policy · e-government

Introduction

Imagine that you worked for a government office in the 1970s and searched for the unemployment data of a particular province over the past five decades. The most common practice was to go to the library and find a statistical yearbook of the National Bureau of Statistics. However, at the end of the 20th century, it became easy to download the data by visiting the Bureau’s

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website. As of the 21st century, the flood of big data obligates public officials to deal with an enormous volume of data in real time. The use of the open Application Programming Interface (API) facilitates access to a government source code for users, resulting in a boost in data volume for the government. The influx of data is controlled by SAS, R, Python, and other statistical and programming languages, and users can quickly utilize them for policymaking. For instance, the World Bank's World Development Indicators consisting of hundreds of variables covering many decades and countries are accessible using simple Open API codes.

Since 2013, the Korean government has released public data that have been compiled over the years, along with an initiative called Government 3.0, which unlocks social statistics in critical policy areas (Ministry of Public Administration and Security (MOPAS), 2012). Having released more than 20,000 datasets offered by 698 public agencies (Open Data Portal, n.d.), Korea is ranked first among OECD member countries concerning data openness. In the beginning, the Korean government provided the data using Excel and a web-based table format, but it recently adopted the open API standards such as XML, JSON, and SDMX.

Despite the technological progress of the Open Government Data (OGD) service, many researchers are highly skeptical in regard to the utilization of OGD for improving the quality of data and policymaking. The skepticism usually ends up with merely a tautological discourse. It becomes more critical to scholars studying e-government to find out why we often fail to utilize OGD provided in an inappropriate form of Open API. In this regard, the utilization gap inevitably appears as some relevant side effects of the rapid growth of e-governance. E-governance requires a large volume of open data, yet Korea might not be fully prepared to provide open data along with the increase in the demand inside and outside of government. This paper attempts to provide an evaluation framework for the utilization of OGD rather than argue an optimistic or pessimistic view toward OGD. The framework consists of four factors: Data and information factors, Technology-related factors, Organizational factors, and Institutional and contextual factors. This paper attempts to figure out which factors cause the underutilization of OGD such as promising technology, Open API, and using the framework.

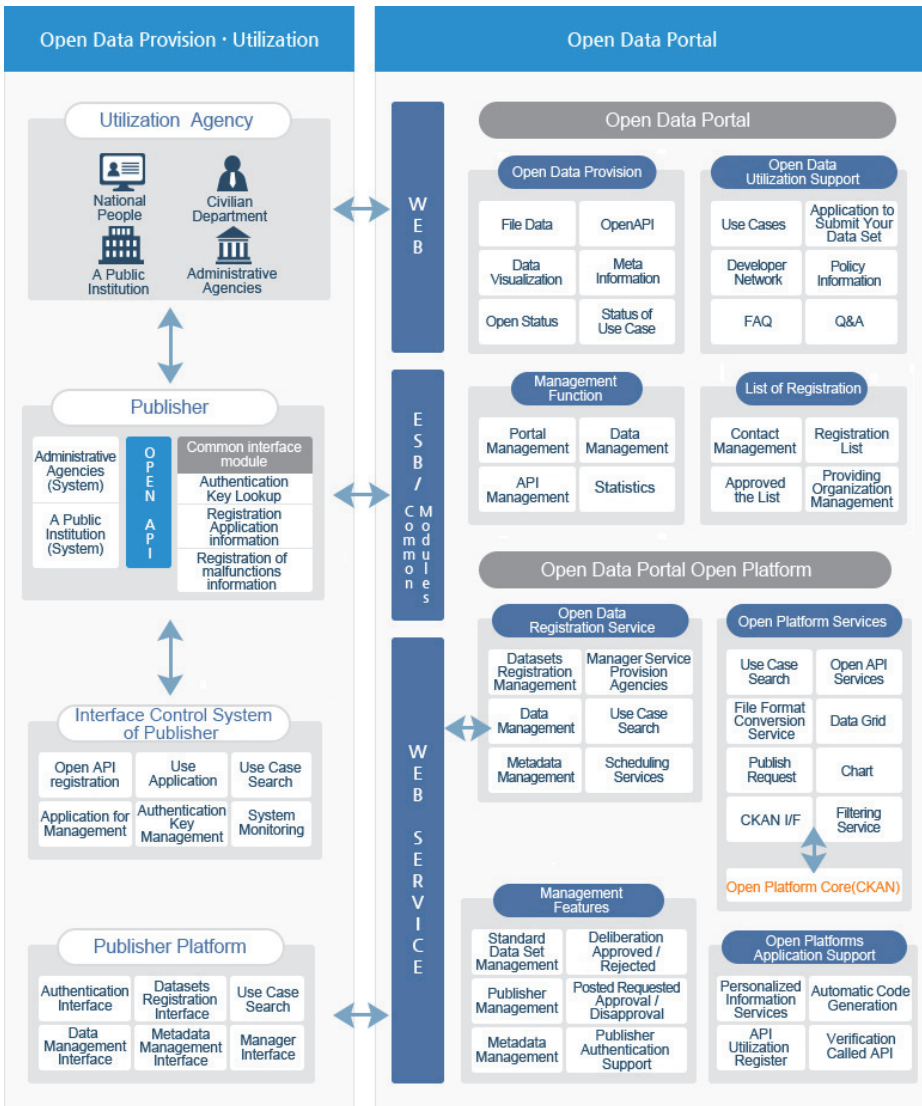
Background of the Adoption of the Open Data Policy in Korea

Retrospectively, it is clear that the Open Data policy should be embedded in the public administration. However, many innovative policies often face various unexpected challenges associated with administrative reform. The Korean government could adopt the Open Data policy under a proper enabling environment. In this section, three key factors are introduced in line with the enabling environment: the President's support, institutional settings, and triggers from civil society. The government of Korea also emphasizes establishing infrastructure for opening data produced by the public sector (Ministry of Public Administration and Security (MOPAS), 2012). The e-government has been an important part of the public sector reform the mid-1990s. Along with the Framework Act on Informatization Promotion (1995), the Master Plan for Informatization Promotion (1996) and Cyber Korea 21 (1999) were formulated amid increasing demand for building a nationwide high-speed communication network along with the rapid adoption of information technology around the world. Without the President's full support for the eGovernment project, the 11 major e-Government initiatives would have been

unable to fulfill their goals. President Kim Dae-jung stressed the importance of creating an e-Government in his speeches and remarks to cabinet members, ministers, and the people. Every week, the president was briefed on the progress of the e-Government project. The Special Committee for e-Government was established as a special committee under the Presidential Commission on Government Innovation, which is an executive branch of the president. Therefore, the Special Committee for e-Government reports to the president as an independent body. The main structure of the Special Committee for e-government is based upon the committee's working level group which consists of civilians and directors of agencies (Government of the Republic of Korea, Special Committee for e-Government Republic of Korea, 2003, p.11). As the OGD movement was initiated as a top-down approach, it was abruptly implemented. As the Presidential agenda in 2013, Government 3.0, was politically backed, Ministries and public organizations which usually hesitated to open their data to the public began to offer the data to the government portal called the "Open Government Data Portal" (www.data.go.kr). In 2013, only 4,718 datasets were provided in the Open Data Portal, but that figure had increased to more than 20,000 datasets offered by 698 public agencies as of 2017 (Open Data Portal, n.d.). The institutional setting was quickly established as well. The Act on Promotion of the Provision and Use of Public Data was promulgated in 2013, and it provided the legal grounds making the public sector consider providing data a default option. Along with the Official Information Disclosure Act, citizens can request that the government publicize information as long as it is not legally prohibited. Financial and human resources were provided on time as well. The Ministry of Interior and Safety made the National Information Society Agency establish the Open Data Portal in late 2011. As shown in Figure 1, the portal adopts the Open API approach, linking many suppliers and users of Open Data.

The Ministries and public agencies embraced the Open Data policy readily because it was regarded as an extension of e-government policy. The Korean government has made an effort to leverage information and communications technology (IT) including broadband internet to improve public and private sector performance and contain growth across the nation over the years. The National Basic Information System (NBIS) computer networks in the 1980s and streamlining of applicable laws and institutions in the 1990s had been the bedrock for the implementation of e-government embedded in the national agenda for the 2000s, and later development of the better open system. As can be seen in Table 1, the e-government of Korea has been developed continuously along with past administrations made contributions toward digital-friendly government.

The third factor opening up the policy window of the Open Data policy comes from civil society. The trigger was a college student who had developed a smartphone application in 2011, which provided estimated bus arrival times by using government transportation data in the Seoul area. The Seoul Metropolitan Government had raised the question of the authority on public data and forced to quit the application temporary. It invoked the debates over the openness of public data. The government could soon foster a constructive discussion on opening public information and promote action to contest government data policies. As a result, the Act on Promotion of the Provision and Use of Public Data in 2013 was finally promulgated with little conflicts.



Source: Open Data Portal, <https://www.data.go.kr/guide/guide/introduce.do>

Fig. 1 System Architecture of Open Data Portal

Summing up, the Open Data policy is the result of political will of the President, legal and administrative institutions supporting the policy, and a trigger escalating the public support significantly. At a glance, the policy seems to be a huge success. According to the UN Global E-Government Survey in the categories of E-Government Development Index and E-Participation Index, as shown in Table 2, Korea is ranked top as of 2018. Furthermore, Korea has facilitated the convenient, efficient and transparent government in the character of “Smart E-Government,” and provided services, including smart, civil service, smart security service, and smart disaster

management. Such Smart-City and Smart E-government are possible due to the infrastructure created by the Open Data policy.

However, the adoption and implementation of the Open Data policy do not ensure the utilization of information for creating values because of the complexity of acceptance of the technology. According to Davis (1989), for instance, the adoption of organizational software depends on users' experience level, types of systems, gender, and other organizational settings (Chau, 1996; Jackson et al., 1997; Doll et al., 1998; Karahanna & Straub, 1999; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000, Carter & Bélanger, 2005). Right after the adoption of the Open Data policy, a great deal of research questions whether the information is used for improving the quality of administrative services, policymaking, and value-creation in the market. At the least, the impact of Open Data policies in public administration remains unclear. As the evaluation framework for OGD utilization is not founded and empirical data are not available enough to evaluate the impact of utilization, policymakers, as well as academics, begin to ask a question on the usefulness of open data which require a considerable amount of administrative time and costs.

Table 1 Development Stages of E-Government in Korea

Stages	Major Actions
Inception (mid 1980s~mid 1990s)	<ul style="list-style-type: none"> ▶ Building 5 National Basic Information Systems (NBIS) ▶ Act on Computer Network Expansion and Usage Promotion (1987)
Foundation (mid 1990s 2000)	<ul style="list-style-type: none"> ▶ Building foundation for high-speed information and communications and promoting the Internet ▶ Enacting the Framework Act on Informatization Promotion (1995)
Launch (2001~2002)	<ul style="list-style-type: none"> ▶ Carrying out 11 major initiatives for e-government ▶ Enacting the Act on E-Government (2001)
Diffusion (2003~2007)	<ul style="list-style-type: none"> ▶ Carrying out 31 roadmap projects for E-government ▶ Laying the groundwork for linking and integrating multiple government departments and agencies
Convergence (2008~present)	<ul style="list-style-type: none"> ▶ Establishing Master Plan for National Informatization (2008) ▶ Carrying out tasks (12) for e-Government based on the principles of openness, sharing and cooperation
Smart Gov (2011~present)	<ul style="list-style-type: none"> ▶ Establishing 'Smart e-Government Plan' as a blueprint for future e-Government (2011~2015) ▶ Enacting the 'Act on Promotion of the Provision and Use of Public Data'(2013) ▶ Establishing 'Artificial Intelligence Information Industry Development Strategy' as a blueprint for e-Government(2018)

Source: The Ministry of Government Administration and Home Affairs (MGAHA), 2016

Table 2 Korea Ranks high in UN Global E-Government Survey

	2005	2008	2010	2014	2018
UN e-Government Development Index	5th	6th	1st	1st	3rd
e-Participation Index	5th	2nd	1st	1st	1st

Source: Ministry of Government Administration and Home Affairs (MGAHA), 2016

Construction of an Evaluation Framework of OGD Utilization

To evaluate the utilization of OGD, we need to develop an appropriate evaluation framework. In this section, we review both the success and barrier factors of open data utilization and provide the evaluation framework accordingly.

Success factors of Open Data and an imbalanced supply- and demand-side approach

Based on the measurement of an information system's (IS) success or effectiveness, DeLone and McLean (1992) have produced the "D&M IS Success Model" as a comprehensive framework for conceptualizing and operationalizing IS success in order to integrate IS research findings. In the D&M IS Success Model, the authors use "system quality" to measure technical success and "information quality" to measure semantic success along with "use," "user satisfaction," and "individual impacts." In this regard, "effectiveness success" is measured by "organizational impacts."

DeLone and McLean (2003) state that certain "net benefits" are to occur along with the result of "use" and "user satisfaction." Given the Shannon and Weaver framework in 1949 and Mason's extensions in 1978 appear as valid until now, the six dimensions of success are interrelated rather than independent. DeLone and McLean (2003) emphasize multidimensional measures of IS Success and the interrelationships among them. DeLone and McLean (2003) have updated their original model by adding a third dimension, "service quality" on top of the two original system characteristics, "system quality" and "information quality."

Gil-Garcia (2012) posits that identifying e-government success measures is essential to assess the accomplishment of objectives. In this sense, it is also vital to understand e-government success factors in order to analyze the reasons behind its success. Gil-Garcia (2012) suggests that e-government success factors be classified into five categories (Gil-Garcia and Pardo, 2005): (1) data and information factors, such as data definitions, compatibility, and structures referring to the quality and management of data; (2) technology-related factors, related to the unique characteristics of the technology used; (3) organizational factors and the relationship between aspects such as formalization, size, communication channels, centralization, and IT success; (4) institutional factors, which apply to any set of rules, formal and informal, regulations, legislation, and more; and (5) contextual factors, with examples of political, economic, demographic, and social variables (Gil-Garcia, 2012, p24). Focusing on customer/citizen-orientation is common among research to analyze user perceptions of e-government projects and intentions of use or expectations (Irani et al. 2007, b; Gil-Garcia et al. 2007; Verdegem and Verleye 2009; Pereira et al., 2017). On top of that, e-government success factors integrated with the updated D&M IS Success Model are analyzed by two strands: (1) the supply-side approach and (2) the demand-side approach by the modified framework in this study. The additional avenues of research will open and lead to further insights into the OGD policy evaluation.

Success factors of OGD and their benefit

Net benefit in the updated D&M IS Success Model can be derived from the list of benefits of OGD. Janssen, Charalabidis, & Zuiderwijk (2012) posit open data mends the traditional

separation embedded in closed data based on system theory and institutional theory. Building on this, the authors posit that opening a system would make a positive impact on the governance and feedback loops for the government to be more responsive. In addition, the institutional theory argues that it will reinforce and transform institutional structure by leading to a more transparent and interactive government (Jenssen, Charalabidis, & Zuiderwijk, 2012). There exists a considerable body of literature on benefits associated with open government data. From a political and a social perspective, open government data can enhance transparency and accountability in the context of the citizens' engagement (Jessen et al., 2012; Conradie & Choenni, 2014; Albano & Reinhard, 2014; Kucera & Chlapek, 2014; Khan, 2017; Altayar, 2018). In light of citizens' engagement, adopting open government data bolsters public participation and the empowerment of citizens, resulting in citizens' satisfaction (Conradie & Choenni, 2014; Huijboom & Van den Broek, 2011; Jessen et al., 2012; Altayar, 2018). The transparency associated with citizens' engagement becomes such a tool to fight with government corruption (Linders, 2013; Hoassin, Y.K., & Rana, 2015). Based on the discussion as mentioned earlier, we can summarize the dimension of successor factors and their benefits as shown in Table 3.

Table 3 Overview of Success factors of OGD and their benefit

Category	Benefits
Data and Information factor	<ul style="list-style-type: none"> Public engagement and scrutinization of data Equal access to data More visibility for the data provider Stimulation of knowledge developments Creation of new insights in the public sector Easier discovery of data External quality checks of data (validation) Availability of information for investors and companies
Technical Factor	<ul style="list-style-type: none"> Creation of new data based on combining data Sustainability of data (no data loss) The ability to merge, integrate, and mesh public and private data The ability to reuse data/not having to collect the same data again and counteracting unnecessary duplication and associated costs (also by other public institutions) Easier access to data
Organizational factor	<ul style="list-style-type: none"> Optimization of administrative processes Improvement of public policies Access to external problem-solving capacity Fair decision-making by enabling comparison
Institutional and Contextual factor (political, social and economic)	<ul style="list-style-type: none"> New governmental services for citizens Improvement of citizen services Improvement of citizen satisfaction Improvement of policy-making processes More transparency Democratic accountability More participation and self-empowerment of citizens (users) Creation of trust in government Economic growth and stimulation of competitiveness Stimulation of innovation Contribution toward the improvement of processes, products, and/or services Development of new products and services Use of the wisdom of the crowds: tapping into the intelligence of the collective Creation of a new sector adding value to the economy New (innovative) social services

Source: Janssen, Charalabidis, and Zuiderwijk (2012, p. 261)

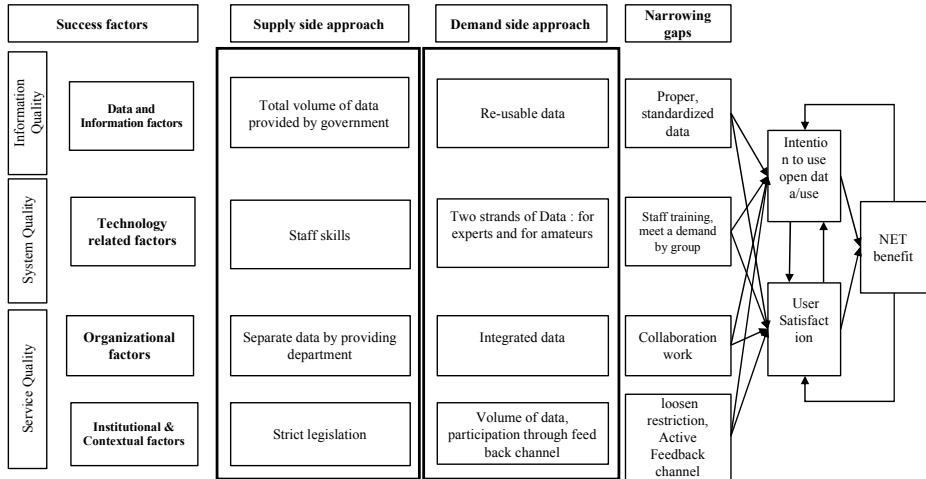
Table 4 Barriers of Adoption of OGD

Category	Barriers
Data and Information factor (Information Quality)	Lack of information
	Lack of accuracy of the information
	Incomplete information, only part of the total picture shown or only a certain range
	Obsolete and non-valid data
	Lack of ability to discover the appropriate data
	No access to the original data (only processed data)
	No explanation of the meaning of data
	No information about the quality of the open data (see category "Information Quality")
	Apps hiding the complexity but also potential other use of open data
	Duplication of data, data available in various forms, or before/after processing resulting in discussions about what the source is
	Difficulty in searching and browsing due to no index or other means to ensure easy search for finding the right data
	Even if data can be found, users might not be aware of its potential uses
	Data formats and datasets are too complex to handle and use easily
	No tooling support or helpdesk
Focus is on making use of single datasets, whereas the real value might come from combining various datasets	
Technical Factor	Contradicting outcomes based on the use of the same data
	Invalid conclusions
	Unclear value: information may appear to be irrelevant or benign when viewed in isolation, but when linked and analyzed collectively it can result in new insights
	Too much information to process and not sure what to look at
	[Essential] Information is missing
	Similar data stored in different systems yields different results
	Data must be in a well-defined format that is easily accessible: while the format of data is arbitrary, the format of data definitions needs to be rigorously defined
	Absence of standards
	No central portal or architecture
	No support for making data available
	Lack of meta standards
	No standard software for processing open data
	Fragmentation of software and applications
	Legacy systems that complicate the publicizing of data
Organizational factor (Use and Participation)	No incentives for the users
	Public organizations do not react to user input
	Frustration at the existence of too many data initiatives
	No time to delve into the details, or no time at all
	Having to pay a fee for the data
	Registration required before being able to download the data
	Unexpected escalated costs
	No time to make use of the open data
	Lack of knowledge to make use of or to make sense of data
	Lack of the necessary capability to use the information
Institutional and Contextual factor	No statistical knowledge or understanding of the potential and limitations of statistics
	Threat of lawsuits or other violations
	Emphasis of barriers and neglect of opportunities
	Unclear trade-off between public values (transparency vs. privacy values)
	Risk-averse culture (no entrepreneurship)
	No uniform policy for publicizing data
	Making public only non-value-adding data
	No resources with which to publicize data (especially small agencies)
	Revenue system is based on creating income from data
	Fostering local organizations' interests at the expense of citizen interests
	No process for dealing with user input
	Debatable quality of user input
	Privacy violation
	Security
No license for using data	
Limited conditions for using data	
Dispute and litigations	
Prior written permission required to gain access to and reproduce data	
Reuse of contracts/agreements	

Source: Janssen, Charalabidis, and Zuiderwijk (2012, p. 262)

Notwithstanding with benefits, the impediments hamper adopting open government data and create a discrepancy between the supply-side and demand-side view of open government. These factors can be derived from the barriers of OGD listed below.

Hence, we can integrate the success and barrier factors and present a multi-dimensional evaluation framework of OGD shown in Figure 2. This framework opens up the black box of OGD utilization by identifying various patterns of supply and usage along with success factors.



Sources of Utilization Gaps of OGD in Korea

Fig. 1 Framework for success factors of open data and an imbalanced supply- and demand-side approach

According to the Open Data Portal of Korea, the definition of OGD is any data or information provided by public institutions to the public. It can be categorized by seven different types in the way data is shared into three groups of information sharing from a technical perspective (Open Data Portal, n.d.). As can be seen in the Table, the group of file data includes categories such as LOD/RDF, Download (hwp, doc, csv, xls, gmp, jpeg), and hyperlink, focusing on reusability. The group of visual contains categories such as Grid, chart, and GIS map in order for users to gain insight easily by providing visualization, focusing on accessibility. Lastly, the group of service delivers data via an open API rather than a dataset download. An Open API originally means the application program interface, allowing all developers to access software and information. Within the context of OGD, the open API usually implies the Open Web API, which allows users to fetch data from the database behind a website. A form of open API is an essential element in both the process of releasing a dataset and supporting its subsequent use. Ideally, documentation will be managed using a content management system that enables its rapid production, review, and publication (Open Data Institute, 2015, p. 25).

Among the different categories of OGD, the open API plays a crucial role in the utilization of OGD. In the case of file data and visual information, users of OGD can access information, but it cannot be easily integrated with future analytical processes. For instance, when we download hourly air pollution and traffic data at the district level in the form of Excel, we have to visit the website, download the datasets, modify and merge them, make the merged dataset

usable through statistical software, and upload the results to the web or other forms. Such a chain of data access and data processing inevitably is prone to human error and takes time. Contrary to such a traditional approach, the open API allows us to directly import datasets into analytical software such as SAS, R, or Python and perform a variety of analyses. Due to this reason, the high-end users of OGD usually worth with the open API rather than the traditional form of data to create values. Therefore, we evaluate the utilization of OGD focusing on that of the open API in the following.

Table 5 Category of OGD

	Category	Approach	format	Principles
Sharing Information	File data	Download	LOD/RDF, Download (hwp, doc, csv, xls,gmp, jpeg), Link	Reusability
	Visual	Web	Grid, chart, GIS map	Accessibility
	Service	Application	Open API	Interoperability

Data and information factors

Supply-side approach and Demand-side approach

DeLone and McLean (2003) state that “Information Quality” is measured in terms of accuracy, timeliness, completeness, relevance, and consistency. Gil-Garcia (2012) also mentions that inconsistencies, inaccuracies, lack of timeliness, and incompleteness of data can cause problems with information quality in line with data and information factors (Chutimaskul et al. 2008; Dawes and Pardo, 2008; Dawes and Helbig, 2010; Madnick et al., 2009; Redman, 1998; Gil-Garcia, 2012). In light of these attributes to measure information quality, the increase in the volume of OGD should be considered in line with the increase in information quality. In addition, according to Open Knowledge International, the key features of openness are availability and access, reuse and redistribution, and universal participation. On top of that, the data must be machine-readable, including the intermixing with other datasets. The government provides open data, resulting in open government, and should interact with its environment (Janseen, Charalabidis & Zuidersijk, 2012). Merely examining the number of public services using OGD, the number has consistently increased since 2013, as shown in Table 6.

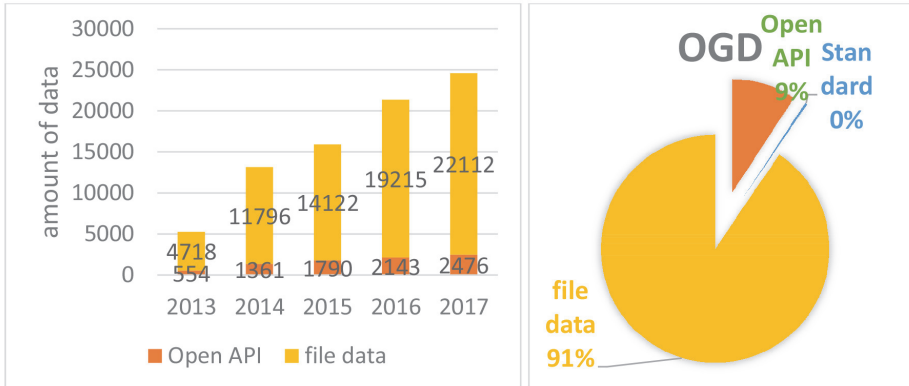
Table 6 The increase in the public service using OGD

	2013	2014	2015	2016	2017	2017
Public service using OGD	13	198	423	762	1,126	1,495
Increase percentage		1,423%	114%	80%	48%	33%

Source: Open Data Portal, <https://www.data.go.kr>

At the same time, the volume of datasets provided at the Open Data Portal has increased from 5,272 in 2013 to 24,588 in 2017 (Open Data Portal, n.d.). However, among the datasets,

and only ten percent of OGD is provided with open API. Considering interoperability of a data platform with open APIs, users far less use the open API than the traditional format of data such as EXCEL, pdf, doc, and hwp. Furthermore, even among datasets provided in the form of the open API, many of them provide the open API for downloading the traditional format data.



Source: Open Data Portal, <https://www.data.go.kr>

Fig. 2 The amount of Open Government Data in Korea

Technology-related factors

DeLone and McLean (2003) reference five studies regarding the direct association between “system quality” and “individual impacts” and those associations. According to them, “system quality” is measured based on ease-of-use, functionality, reliability, flexibility, data quality, portability, integration, and importance and “individual impacts” is measured based on the quality of the work environment and job performance (DeLone and McLean, 2003). These measurements of “system quality” introduced by DeLone and McLean are integrated with technology-related factors in terms of ease-of-use, functionality, and reliability.

Gil-Garcia (2012) states the newness and complexity of the technology as barriers impeding the result, and similarly, staff skills are significant in both technology and non-technology areas. Concerning the supply-side approach, it seems to be essential to improve staff skills. Looking into the level of IT skills in the public sector in Korea, it is a credible IT level. As can be seen in the Table, agencies have awarded the Government of Korea awards and citations for the best practices. For example, the certificate of ISO 20000 which the Korean government received is the international IT service management (ITSM) standard. ITSM enables IT organizations to meet the needs of the business (ITgovernance, n.d.).

On top of that, Korea has shared its e-government experience by exporting e-government systems to other countries (Open Data Portal, n.d.). According to the World Bank (2017), IT training for government employees leads to the development of Korean e-government by providing the list of IT training for government officials, including senior management. Yet, the primary purpose of IT training for government officials is to prevent misuse of OGD and create a healthy environment for the usage of OGD according to Article 25 of the Act on Promotion

Table 7 Award and the best practice

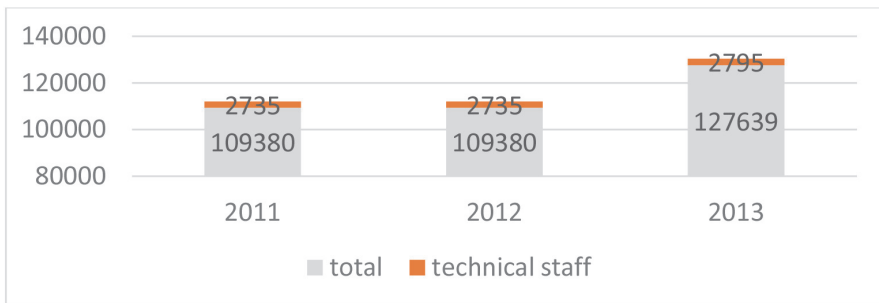
items	Services	Contents
Informational Awards	Immigration Review	United Nations' Public service awards(2007) 'e-Asia Award'by the Asia Pacific Council for 'First Prize in the Demonstration Area' by e-Challenge (2010)
	Information Network Village	'e-Government Sepcial Awards by the World e-Gvernment forum (2006)
	Korea Online e-Procurement System	'e-Asia Award'by the Asia Pacific Council for Trade Facilitation and Electronic Business (AFACT)(2007)
	Electronic Customs Clearance	'WCO Trophy by the World Customs Organization(WCO)(2006)'e-Asia Award by AFACT(2007)
	e-Hanaro, National Computing & Information Agency. E-Architecture information System	'First Prize in the Demonstration Area' by e-Challenge (2010)
Citations for best practices by international organizations	Home Tax	'Good Practices of Electronic Tax Administration' by OECD (2006)
	e-People	'Top 10 e-Government' by the World e-Government Forum (2006)
	Electronic Trade	'World Advanced' by the APEC 2005 Report (2005)
	Urgent Disaster	'Good Practices' by the Asian Conference on Disaster Reduction (2006)
	Electronic Customs Clearance	'Good Practices of Anti-corruption' by the Global Forum on Fighting Corruption (2003)
International certificates and standards acquired	Korea Online E-Procurement System	'International Bidding Standard of the 6 th Forum of UN/CEFACT (2005)
	SPI-1357	'Joint Statement' of the 13 th Asia-Pacific Economic Cooperation Small and Medium Enterprise Ministerial Meeting (2006)
	Patent Application	'Information Technology Standard' of WIPO (2006)
	Patent Application	ISO 20000 Certificate (2006)
	Agricultural Food Safety	ISO 9001 Certificate (2005)
	Electronic Customs Clearance	ISO 20000 Certificate (2006)
	Clearance	ISO 9001 Certificate(2006)

Source: UN (2016)

of Information and Communications Network Utilization and Information Protection, Etc. Accordingly, most of the IT training of government officials in Korea is provided in this regard. The contents of IT training should be adapted in line with the need of government officials in order for them to utilize it along with their tasks.

However, from the demand-side approach, there has been a lack of opportunities to learn to utilize OGD, and advanced technology seems to challenge users to utilize it. There are two strands of technical approach from the demand-side approach at the level of technical skills users acquired—the primary level and the advanced level. First, the visualization of data is undoubtedly one of the keys in order for users who acquired a basic level of technical skills to

understand data easily. Also, proper IT training will be helpful for users who acquired a basic level of technical skills. From the survey mentioned above, the lack of technical skill is the second most common reason not using OGD. It needs to be considered for users to be citizens as well as government officials. Second, it is vital to provide advanced types of OGD such as open API in order for experts with advanced skills to utilize and reprocess data. These experts can create added value along with proper OGD. In this sense, it is vital to create enabling environments for these users. However, there has been a problem in deficient human resources in the public sector, according to the survey based on thirteen government agencies (comworld, 2014). As can be seen in the Figure, the technical staff in charge of OGD is only 2.2 percent of the total government staff.



Source: comworld, 2014

Fig. 3 The number of technical staff compared to the total number of government officials

According to the government official who works at MIS from the forum, the main reasons for not providing data from the government agencies are due to a lack of technical skill to create the standardized data. That being said, it is hard for them to convert their data to reusable data along with the standard or open API. According to the public request for open data, government agencies are not able to meet the public's demand. Providing appropriate technical training is not only for government officials to provide open API but also for them to utilize it.

Organizational factors

As OGD is produced by many departments and agencies, there was an active call for creating the government-wide Open Data Portal for the collaboration among organizations, not only for data compilation. One option was to use the National Statistics Bureau as a hub for the Open Data Portal. However, the NSB was highly dependent on the Ministry of Planning and Budgeting and did not have legal and political authorities to draw support from other Ministries and agencies. Hence, the Korean government established the Open Data Portal under the Ministry of Interior and Safety (MIS). Although MIS has been in charge of e-government policy, it has less expertise compared to the National Statistics Bureau. Because of the tension, MIS is necessary to create standardized OGD. According to the Necessity of Public Institutions' Database of Standardized Guidelines based on Article 23 (Open Data Portal, n.d.), to comply the production, operation, and the opening of the open database system with standardized

regulations, revisions of the “provision and use of activated Open Data Act” is imperative to prepare a high-quality data-utilizing base. OGD is needed to comply with the standardized regulations based on Article 50 of the E-Government Act (Standardization) and Article 59 of the E-Government Act enforcement ordinance (Standardization) embedded in the “Database standardized guidelines for public institutions” (Open Data Portal, n.d.). Yet, many government agencies put less effort into it. The new interactive potential of ICTs allows for more innovative sharing of information and greater collaboration both within the different government departments and among different branches of government, as well as with citizens (Francoli, 2011). Zuiderwijk and Janssen (2014) believe that more systematic collaboration is helpful since there are enormous opportunities for learning from each other. Considering the limited resources of the government, the collaboration also could develop measures to improve the quality of the data. Moreover, it would attract potential users (Zuiderwijk & Janssen, 2014) From the demand side of the approach, there is a need for merging OGD provided by each department and reprocessing by users’ interest. Open data collaboration is defined in several ways. For the Global Open Data on Agriculture and Nutrition (GODAN) initiative, it provides a space where researchers and practitioners can share, discover, analyze and discuss open data. In a related argument, Verhulst and Sangokoya (2015) show support for what they call a “collaborative”, which they refer to as “a new form of collaboration, beyond the public-private partnership model, in which participants from different sectors—including private companies, research institutions, and government agencies—can exchange data to help solve public problems”.

Institutional and contextual factors

Gil-Garcia (2012) states that the institutional factors are related to laws and regulations, including norms, actions, or behaviors in organizational settings. According to the public information disclosure law, the scope of public data to be provided is in the context of all public data held and managed by public institutions with exceptions of excluded information based on Article 17 of the Act in Korea. There has been a debate over the strict restriction on disclosure of information. Enhancing de-identification of personally identifiable information might stimulate public agencies to produce OGD according to the “Public Information disclosure law” subject to non-disclosure as per Article 9 in Korea. National Core Data refers to selected OGD based on a high level of urgency and high demand, and it is the high-quality and the largest volume of data for citizens and the private sector to generate added value. It is good to consider an amendment of laws and regulations to promote the participation of the private sector.

Second, the institutional theory requires the study of technology, including e-government systems, to focus on the interaction between people and the system, and to capture historical processes as social practices evolve. These social practices and processes are executed by the interactions among actors or stakeholders such as unions, investors, shareholders, financial institutions, customers, intermediaries, suppliers, academic institutions, business associations, and social activists (Hoffman, 2001; Silva and Figueroa, 2002; Kim, Kim & Lee, 2009). In addition to that, Gil-Garcia (2012) refers to contextual factors as numerous environmental factors constitute the context of organizations. The notion of “feedback” is vital in open systems and refers to the situation in which activity within a system is the result of the influence of one

The screenshot displays the 'Developer Network' page on the Korean Open Data Portal. At the top, there is a navigation bar with 'Data Set', 'Application', 'Use Cases', 'Sharing Info', and 'Information Use'. Below this, a sidebar on the left lists various categories like 'Information', 'Data of the Month', 'Developer Network', 'Policy Information', 'LOD Service', 'Notice', 'PDS', 'FAQ', and 'Q&A'. The main content area is titled 'Developer Network' and includes a sub-header 'Information / Developer Network'. It features a search bar and filters for 'All', 'Troubleshooting', 'Development Knowhow', and 'User Forum'. There are two main sections: 'Most commented' and 'Most recommended', each with a list of forum posts. The 'Most commented' section shows three posts, and the 'Most recommended' section shows three posts. Below these, there is a table of forum posts with columns for 'Total 350 rows', 'All', and a search icon. Two posts are visible: 'Please help me.' and 'I am wondering about parameter values.', both with 1 comment and 0 recommendations.

Source: Open Data Portal, accessed on Nov, 2018

Fig. 4 Feedback Channel in the Korean Open Data Portal

element on another (Jackson, 2003; Wiener, 1948; Jenssen, Charalabidis & Zuiderwijk, 2012, p259). The implication of the notion of feedback in system theory is that, in opening their data, the government should not merely instigate one-way communication of their data, but should expect or actively solicit feedback and be able to make sense of this feedback (Charalabidis & Zuiderwijk, 2012, p. 259). Policymaking should be studied as a complex interactive process without beginning or end, influenced by the devised nature of socio-political and other environmental forces (Birkland, 2011; Osman 2002, Zuiderwijk & Jessen, 2014). A culture of openness exists in which the Open Data policy is part of all working processes and data is automatically publicized without the need for lengthy discussions (Zuiderwijk & Jessen, 2014). Yet, in Korea, there does not seem to be activities in the feedback channel and the section of users' forum within the National Data Portal. There have been only 350 opinions shared in the portal from 2013 to 2018.

Last but not least, the government should not be the sole provider for open data. Open data is provided by government agencies and offices in a wide range of formats, making it difficult to compare and combine different datasets. According to Ballivian & Hoffman (2015), data is more usable along with collaboration between the public and private sectors and common data standards. Several companies have taken government datasets, hosted them, and added value to them in ways that include building custom interfaces for users and developers. The USDA, for example, has worked with the private sector to develop the portals for crucial datasets. At the

same time that they broaden the audience for usable data, organizations that help provide access to open government data can help ensure that sensitive data is protected. The private sector can help ensure that data is managed securely to protect privacy—for example, by using anonymization techniques, by providing “data enclaves” to allow data analysis under secure conditions, or by restricting access to data in other ways. The simple act of releasing data publicly, allowing stakeholders to use, understand, and help improve the data, can provide opportunities to improve data quality (Open Data Institute, 2018). The private sector also can help government agencies address data quality issues by identifying the most relevant datasets for improvement and providing feedback on how to improve them.

Discussion and Conclusion

While OGD becomes crucial for improving transparency and evidence-based policymaking and its size and related technologies have evolved rapidly, many have less confidence in the utilization of OGD for policymaking. This paper raises a series of questions such as: what factors are related to the utilization gap, how should the evaluation framework of the utilization of OGD be developed, and what is the status of the OGD of the Korean government.

Regarding the factors causing the utilization gap, we identify that the gap is more than the technical challenges in data collection, processing, and analysis. As several studies suggest, many factors affect the degree of the utilization gap such as information, organization, and service quality determined by supply and demand sides. Hence, we suggest a holistic evaluation framework for the utilization of OGD to evaluate the Korean OGD, which is regarded as one of the most advanced ones among OECD countries.

This paper finds the following implications using the evaluation frame. First of all, notwithstanding the increase in the volume of data, most OGD is serviced in the format of Excel, or web-based tables which are not easily merged with other datasets. Although the Korean government adopts the Open API technology which expedites the accessibility and manageability, only a few datasets adopt the Open API, and few of them are used for the value creation in the public and private sector. More seriously, due to the lack of training of public officials on OGD, the technological progress immerses into work processes.

Regarding organizational factors, in order for each public agency to collaborate to produce OGD, it is necessary to create standardized OGD. Regarding institutional and contextual factors, first, loosening the unnecessary restriction on OGD along with enhancing de-identification of personally identifiable information would stimulate OGD usage. Also, it is vital to have multiple channels to interact with users. Last, it is crucial to collaborate with the public and private sectors on providing open data.

The supply-driven OGD usually overlooked a simple question: Will it be used for what purpose? Previous studies on OGD focused on issues concerning the possibility of providing a large amount of Open Data rather than the gaps to fill between the supply-side and the demand-side of Open Data. Some studies paid much attention to the evaluation of the quality of Open Data, in particular, to the Open Data maturity model and benefits of Open Data. It inevitably means it is significant in the further development of OGD. Yet, given that the evaluations are designed to increase the benefits of Open Data, there has been a need to conduct a more

empirical study to see how OGD is utilized in public. Concerning previous research, this study takes perspectives as it focuses on the supply-side and the demand-side of Open Data in addition to the framework on the quality of OGD and success factors of OGD. In this respect, this study has widened the view on OGD in Korea concerning the discrepancies between being high ranked in e-government but having relatively low utilization in public. Despite all the attention on OGD, government officials in Korea have often fallen short in making the provision for Open Data.

It may be useful to study further other countries in order to understand which factors hamper the utilization of OGD. For example, the UK's adoption of OGD is one of the first such initiatives in the world. The UK government has a strong open data policy and strategy along with the involvement of stakeholders and better feedback mechanism (Safarov, 2019). Future study will involve developing a more detailed framework for open data governance strategy, including the maturity model to develop, assess, and refine more specific open data governance programs.

Recommendation

This study may contribute practical insight to government officials in Korea as to how data quality evaluation might affect utilization of OGD. First of all, they should reframe the optimistic view of the amount of OGD. The study shows that interoperability affects the utilization of OGD. With regard to the findings of this study, it is crucial for government officials to take into consideration the utilization of OGD by recognizing the demand-side approach regarding the data and information factors, technology-related factors, organizational factors, and institutional and contextual factors. Furthermore, they should put more effort into the evaluation of the quality of Open Data based on the feedback. It is needed to share the standard of the provision for Open Data in order for them to foster cross-department collaboration in an attempt to improve service quality.

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