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Based on AHP to Discuss Critical Factors in Open Government Data

Jie-Shin LIN[1], Yu-Lung WU[2]

Abstract

The expansion of the government has the role definition and administrative category become more complicated. Meanwhile, the government controls the capacity and power to collect huge domestic national data, whose quantity and quality possessed by the government far exceed those controlled by private enterprises, organizations, and individuals. Along with the boom of digital technology and Internet, the emerging brand-new service depends on huge open government data. The questionnaire for this study is randomly distributed to the mass society in southern Taiwan to understand the weights of factors in the mass society. Total 300 copies of questionnaire are distributed, and 271 valid copies are retrieved, with the retrieval rate 90%. The research results reveal that political and social is mostly emphasized among dimensions in Hierarchy, followed by technical and economic and top five indicators, among 15, are ordered public license, single entry, governance transparency, data resolution, and data reuse. According to the results, discussion and suggestions are proposed, expecting to help the government further legislates for simplifying the openness process, reduce costs or commercial data use, and promote domestic competitiveness.

Keywords: open government, government data, critical factor, social participation, public sector, social movement.

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Introduction

Along with the advance of information technology and the approach of big data era, governments in various nations have earlier started making policies related to open government than domestic government. With the expanding government, the role definition and administrative category of the government become more complicated. Meanwhile, the government controls the capacity and power of huge domestic national data, whose quantity and quality far exceed those controlled by private enterprises, organizations, and individuals. In order to enhance citizens' accountability for government, the government should open the government information and ensure the availability of such information. Under such context, the enhancement of accountability is the objective of open government, while availability is simply the essential tactic to enhance accountability. Open data related policies allows privately or commercially accessing public sector information and the reuse, which merely requires the lowest legal, technical, or commercial limits, or even without limits, to facilitate information flow. Information flow could benefit business operators as well as allow the public having a place for the development of brand-new service. Such brand-new service is based on innovative combination and utilization of information to enhance commercial distribution and social participation.

Along with the boom of digital technology and Internet, the emerging brand-new service depends on huge open government data. Commercially, a creative enterprise could integrate, repackage, and spread data released by the government and develop new applications and platforms to explore the hidden value of government data. For instance, an enterprise could combine the original geographic data offered by the government with other useful information for information service of public tourism and business consumption. Huge data are not possibly handled manually. In this case, open geographic data from the government have to match the requirement for "machine processable" to satisfy the goal of application service. The so-called "data integrity" refers to the government providing the most complete source files without being corrected and deleted. It is the effort made by participants in open government data movement. Essentially, information in open government is the "information" compiled and interpreted by the government that people can hardly track back the originally collected state nor participate or understand the data selection process. It largely limits people's political participation and development of brand-new application and service from the data. Open government data appeal to the government opening the possessed data according to people's request and actively making public of original "data" for complete and original reappearance of the data as well as according to open format for data activation and application. In this case, open government data should be data application oriented to actually promote open government data policies to realize the policy goal. AHP is therefore applied in this study to discuss critical factors in open government data, expecting to help the government further

legislate for simplifying the open process, reduce costs for commercial data use, and promote domestic competitiveness.

Literature review

Open government data

Hou & Wilder (2015) mentioned that open government data sometimes was called open public sector information. Seongil & Dongwan (2019) stated that open government data, in the policy and practice, would cover 1.the availability, accessibility, and reuse of public sector possessed data and 2.being spread with free of charge or charging few and lowest value-added fee. Open government data might sometimes be confused or misused with "open government" or "open data". There were correlations among the three, but they were in fact different concepts. Ferguson, Thornley, & Gibb (2016) explained that the confusion or misuse was indeed related to the history development; it started from open government, open data was developed after information technology, and then open government data were the combination of open government and open data appeared. McNabb (2018) stated that open data could be tracked back to 1970s, when NASA (National Aeronautics and Space Administration) co-operated satellite earth stations with various countries and signed agreement to open the data among the participation members in order to ensure NASA and the US government accessing the data generated in the operation. Sowon (2018) indicated that the idea of open data was different from what people understood nowadays, and they merely appeared effectiveness and were shared among parties in the contract for scientific research.

Boychuk *et al.* (2016) explained that present open data referred to "open data from the government or other sources for people's access for individual or commercial use" and appeared after the prevalence of network development. Current open data were developed along with the development of digital technology and a series of social movement, which expected to liberalize information through digital technology and network and enhance the broad communication of information. Such action appeal also contained to enhance open access, open education resources, open standards, and free or open-source software (Nikolić & Cvejić, 2017).

Jongpil & Daejin (2017) mentioned that a lot of organization groups, experts, and scholars proposed different definitions and explanations of open data, in which "G8 Open Data Charter" signed by Group of Eight and "International Open Data Charter" presented the most authority and official status. Collins *et al.* (2018) mentioned that International Open Data Charter promoted by international organizations of United Nations, Group of Eight, and Open Government Partnership in 2013, aiming to enhance the consistency and collaborative communication of data openness among nations and establish common principles and standards

for global data openness. International Open Data Charter, by the end of July, 2018, was signed by 19 nations, 35 local governments, and 46 non-governmental organizations; the importance was apparent (Robinson & Bawden, 2017).

Junghee (2016) pointed out six open data principles in International Open Data Charter (Taeseop & Jungah, 2016): (1) Open By Default; (2) Timely and Comprehensive; (3) Accessible and Usable; (4) Comparable and Interoperable; (5) For Improved Governance & Citizen Engagement; (6) For Inclusive Development and Innovation.

Kapoor, Omar, & Sivarajah (2017) mentioned that such 6 points covered several dimensions, but revealed the international goal of open data. Comparing such 6 principles with the goal of "ensuring availability to enhance accountability" of open government, it was discovered that allowing people accessing data, under the open data principle, did not simply aim to enhance people' accountability for the government, but to fully use such data for achieving the goals of innovation and development. In comparison with "knowing" in open government, "use" of open data was oriented (Frank *et al.*, 2016).

Sarang & Daejin (2017) indicated that the open tactic should satisfy certain conditions to realize the use objective of open government data. For instance, Carl Malamud *et al.*, advocators of open government data, proposed 8 open government data principles in 2007, which had government data realize the goal of combining with commercial service (Tene & Polonetsky, 2017), including: (1) Complete; (2) Primary; (3) Timely; (4) Accessible; (5) Machine processable; (6) Non-discriminatory; (7) Non-proprietary; (8) License-free.

Policy goal of open government data

After discussing the background and principles of open government data, the goals being regarded as the direction of open government data policies of the government are continuously understood. According to the research result of Wolff *et al.* (2016), open government data could be induced into three dimensions.

1. Political and social: Following the spirit of open government, people have the right to know. In addition to selected and compiled information selectively made public by the government, the government opening as much original data as possible could enhance the accountability of responsible politics and promote people' participation in government governance; meanwhile, the enhancement of government transparency could benefit the development of democratic society.
2. Economic: Creative individuals or enterprises could develop the government possessed huge data into brand-new service and products, and the broad use of data could create brand-new markets and business models to promote economic activity.

3. Technical: Technically, the interoperability and usability of data and the use of open format could be used for reducing obstacles in the cooperation or development.

Above three goals would repeatedly appear on open government data policies in various nations, be presented with different formats, or be extended or similar to the expression of other different ideas. In the policy goal of open government data discussed in this study, complicated targets and the extension would be induced in such three dimensions to clarify the focus.

Methodology

Research method

Hosseini & Keshavarz (2017) pointed out the confirmation of critical success factors with (1) regression analysis, (2) factor analysis, (3) Delphi method, and (4)Analytical Hierarchy Process (AHP). Garbuzova-Schlifter & Madlener (2016) proposed to use the meaning of Analytical Hierarchy Process that collecting the opinions of scholars, experts, and participants through group discussion to simply complicated problems into a hierarchical evaluation system with simple elements and to calculate the contribution or priority of the component elements in various hierarchies corresponding to the previous hierarchy, according to experts' opinions. The scholars, according to management process, confirmed the target tasks through objective interviews with department supervisors, and proposed personal critical success factors according to personal practical experience and needs. With analyses and selection, critical success factors to achieve the goal were then organized and ordered so that corporate resources could be effectively distributed in the critical factors. Finally, indicators were established for measuring the practice effectiveness.

Experts' questionnaire survey is adopted in this study. In consideration of the problems of mean, decision-making attribute related, and inaccurate group decision in traditional Delphi method, Analytical Hierarchy Process (AHP) is applied in this study to analyze data in order to definitely select critical factors in open government data.

1. Fuzzy Delphi Method (FDM): Murray *et al.* (1985) first integrated fuzzy theory into traditional Delphi method for Fuzzy Delphi Method, which applied the value of correspondent variables to express human semantics. For example, weights for semantics, in human natural languages, could be regarded as a language variable, with the value of "extremely low", "low", "medium", "high", and "extremely high", or other words with different levels, which were given weights for the estimation. Murray *et al.* (1985) proposed the fuzzy semantic

variable for evaluation, aiming to solve fuzziness problems in traditional Delphi method; however, more specific calculation was not proposed. Successive researchers proposed solutions, such as range, fuzzy integral method, triangular fuzzy number, and double triangular fuzzy number.

2. Analytical Hierarchy Process: After integrating experts' opinions, complicated decision system was constructed a hierarchical system to clarify problems by developing hierarchically. Dual appraisal was further completed with pair-comparison principle to evaluate the importance of factor weights.

Indicator building

The first questionnaire, titled "critical factors in open government data", is emailed to experts in various fields. The feedback is organized to determine the items considered in open government data. The considered factors with similar properties are classified and emailed back to the experts for opinions. With several runs of inquiry, major categories are determined. An expert conference is then called to make critical factors in open government data, including political and social, economic, and technical, as the AHP dimensions. The AHP questionnaire is further established with the corresponding categories as the principles. The following indicators are modified through Fuzzy Delphi Method.

1. Political and social: access channel, governance transparency, information service, restriction of competition, public license.
2. Economic: added value and application, creation of knowledge assets, metadata, data resolution, added value.
3. Technical: collaboration, format interoperability, resource integration, data reuse, single entry.

Research object

The research questionnaire is distributed to the mass society in southern Taiwan to understand the effects of factor weights on the mass society. With random sampling, 300 copies of questionnaire are distributed, and 271 valid copies are retrieved, with the retrieval rate 90 %.

Results

After completing all hierarchical weights, the allocation is preceded according to the relative importance of indicators to show the importance of indicators in the entire system as well as to generate the overall weight of open government data, *Table 1*.

Table 1. Overall weight of open government data

dimension	Hierarchy 2 weight	Hierarchy 2 order	indicator	overall weight	Overall order
political and social	0.363	1	access channel	0.071	6
			governance transparency	0.096	3
			information service	0.052	11
			restriction of competition	0.025	15
			public license	0.115	1
economic	0.295	3	added value and application	0.061	9
			creation of knowledge assets	0.034	14
			metadata	0.043	13
			data resolution	0.087	4
			added value	0.069	7
technical	0.342	2	collaboration	0.047	12
			format interoperability	0.065	8
			resource integration	0.058	10
			data reuse	0.074	5
			single entry	0.103	2

Discussion

When the government possessed complete copyright, database right, or related intellectual property, public license allows data, without the agreement of owners or application for use, being provided for users to enhance data flow and promote the economic value. Most open government data in UK are released according to the public license terms in OGL (Open Government Licence) for users' commercial or non-commercial use with free of charge, but simply labeling the data source. Public license is also adopted domestically to "authorize users' non-exclusive, irreversible, and license-free use without limiting objectives, time, and locations". A lot of nations would strengthen democracy and enhance government transparency and accountability as the major policy goal of open government data. The evaluation of government transparency presents the difficulty, but people could hold positive attitudes towards such policies, as both European Union and the UK insist on "principle open, exception exclusion" to ensure the openness and reuse of most government data. In principle, a unified data open platform is

used for the openness, rather than being self-established by institutions. It would benefit users searching for data. The other problem is that the government provides claim channels, but users without basis of claim could not access the desired data. People therefore have to claim open government data competent authority for data with Openness of Government Information Act as the legal basis. The provision of a unified data release space for data owners could benefit data organization; besides, the upload format could be restricted through database and webpage design to satisfy the requirements for programmable reading, opening, and access and make the successive use smooth. Users could also search the required data from the unified web portal.

Conclusion

From the questionnaire survey, *Table 1*, the following conclusions are summarized.

Among dimensions in Hierarchy 2, "political and social, weighted 0.363 and about 36.3% of overall weight, is the most emphasized dimension, followed by "technical" (weighted 0.342) and "economic" (weighted 0.295). According to the results, political and social is mostly emphasized in open government data.

Among indicators in Hierarchy 3, the indicator weights are ordered as below:

1. Indicators in political and social dimension are ordered public license, governance transparency, access channel, information service, and restriction of competition.
2. Indicators in economic dimension are ordered data resolution, added value, added value and application, metadata, and creation of knowledge assets.
3. Indicators in technical dimension are ordered single entry, data reuse, format interoperability, resource integration, and collaboration.

By organizing the overall weights of indicators from the questionnaire of critical factors in open government data, top five emphasized indicators, among 15, are ordered public license, single entry, governance transparency, data resolution, and data reuse.

Recommendations

The analysis result of critical factors in open government data could be the reference for relevant departments.

1. The public license, "Open Government Data License", is currently adopted for domestic open government data. Apparently, there is not the doubt for charge under most situations. Nevertheless, when the regulations do not completely

rely on administrative rules and license terms, it would be the presentation of legislational laziness and even infringe the original rights of people caused by policy changes due to party alternation. For this reason, it is considered in this study that, under the problem of most data without charge, amending the law to regulate the charge cap is necessary.

2. When the government possesses complete copyright, database right, or related intellectual property, data are offered for users without the agreement of data owners or application to enhance data flow and promote the economic value.
3. With the effect of data originality test of domestic open government data, a lot of government data are not protected by copyright, but belong to the public, i.e. the government not possessing the copyright. However, when the license agreement is acceptable for both parties, the government could legally authorize such public data. It is suggested in this study that the government, under the premise of enhancing data use and not involving in license agreement, should release data with public license, when the data owner confirms the data not belonging to a third party or even the data reveal copyright dispute over originality test.

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