A Conceptual Model of Open Government Data Adoption for Local Authorities in Malaysia

Siti Isnaine Haini, Nor Zairah Ab. Rahim, Norziha Megat Mohd Zainuddin

Advanced Informatics School, Universiti Teknologi Malaysia

sitiisnaine@gmail.com, nzairah@utm.my, norziha.kl@utm.my

Article history

Received:
2 July 2019

Received in revised form:
25 August 2019

Accepted:
30 September 2019

Published online:
3 October 2019

Siti Isnaine Haini,
sitiisnaine@gmail.com

Abstract

One of the key initiatives in Eleventh Malaysia Plan (RMK-11) in enhancing public service delivery is to leverage data to enhance outcomes and lowering the costs. In line with this vision, implementation of digital government is planned to offer more innovative services, that is accessible to the citizen and provide efficient and integrated service delivery by 2020. Thus, Malaysia has launched its Public Sector Open Data (PSOD) portal for agencies to share data with each other and to facilitate Open Government Data (OGD) philosophy and policies. Data from official sources are stored in a centrally-accessible repository. However, the rate of adoption by the government agencies specifically local authorities in sharing their dataset at PSOD portal shows a very slow progress. This scenario is in contrast to the needs of smart city implementation that require a combination of open data and Internet-of-Things technology at the local authorities' level. Therefore, the aim of this paper is to identify and analyze the influencing factors of OGD adoption by conducting expert review with five (5) experts from a central agency, local authorities and public university. Fifteen (15) identified factors from the literature review and eleven (11) factors have been validated and individually ranked by the selected experts. A conceptual model of OGD adoption for local authorities in Malaysia which is based on Technology-Organisation-Environment, Diffusion of Innovation and Institutional Theory was proposed as the outcome of the study.

Keywords*:Open Data, Open Government Data, adoption, local authority, public sector*

1. Introduction

Open data trend was believed to have started in 2009 when President Barrack Obama introduced openness in government by issuing Memorandum on Transparency and Open Government. The mandate was affirmed by his administration to show their commitment for government innovation with the promotion of a collaboration, public participation and

transparency across government bodies. It was also the indication of a new government era to become more open and accountable as an attempt to unite the gap between the American people and the government. This scenario has inspired other countries to take similar steps by way of conveying respective countries government directives to disclose identified dataset to the public for reuse and distributed without any restrictions.

In general, open data can be defined as data that is available online that can be freely used, accessible, re-use and redistribute for any purpose by anyone without technical restrictions and limitation [1],[2],[3]. Some of the discovered benefits on this innovation includes increase transparency and accountability in government, empower the citizen participation of government service and to stimulate the economic growth through re-use of data [1]–[4]. The term of Open Government Data (OGD) or also known as open Public Sector Information (PSI) is non-confidential government data freely available in open formats and published on the Internet for free use, re-use and redistribution without any restrictions [8],[1]. OGD comes from combination of a specific subset from government data and open data. In addition, open data is an essential part in adopting smart city. Smart city depends entirely on ICTs strategies and solutions which have direct involvement with local authority, citizen and community [9]. Moreover, smart city concept uses data and Internet-of-Things (IoT) applications to enhance efficiency for the provision of local authority services [10].

In most developing countries, OGD initiatives are still at its infancy stage resulting in many challenges exist at the implementation level [11],[12]. For some countries, one of the challenges is cost because it may be incurred for publishing public data (in connection to production and presentation) [2]. Despite those challenges in data publication, Huang et. al, [5] stated that OGD must be studied and observed at national level to better understand factors that influence OGD adoption. Thus, this paper highlight OGD adoption from Malaysia perspective.

This article is arranged as follows: It starts with a research background and follows by a section that focuses on theoretical background. The fourth section explains the research methodology used in this study. Subsequently, the remaining sections will describe the result and discussion of the influencing factors and followed with conceptual model proposal for OGD adoption. Then the study is concluded by highlighting the research contribution together with suggestions for future research work.

2. Background

In Eleventh Malaysia Plan (RMK-11), the Government focuses on becoming citizen-centric government particularly on enhancing the productivity and efficiency of the public service. Implementation of the Digital Government is designed to offer more innovative services, accessible to the citizen and provide efficient and integrated service delivery by 2020. One of the key initiatives in enhancing public service delivery is to leverage data to enhance outcomes and lower associated costs. Thus, to support the implementation of the Digital Government, capitalizing local authorities' resources for quality services is stated in RMK-11 as a focus area

of transformation. In line with this vision, Public Sector ICT Strategic Plan (PSISP) 2016-2020 was developed, which states the second strategic thrust in PSISP known as data-driven government outlining strategic direction to strengthen cross-agency data-sharing. To achieve the data-driven government vision, Malaysia Administrative Modernisation and Management Planning Unit (MAMPU) has been given the mandate by the Government to lead Malaysia's data-driven initiative with collaboration from all ministries and departments.

In 2014, the Government IT and Internet Committee (GITIC) Meeting has agreed that the government agencies need to implement the data-driven innovation which open the gateway for open data initiative. This initiative required all government agencies to identify and share suitable data sets in every area of agency service. Thus, a dedicated platform for agencies to share data with each other was successfully developed in the same year known as the Public Sector Open Data (PSOD) in the shape of public portal [6]. This portal is aimed to facilitate OGD that is centrally accessible from official sources by all data users. This is in line with the need of the cross-agency data sharing functions in providing comprehensive data analysis. Therefore, numerous activities regarding open data knowledge, engagement programs and awareness have been provided to the government agencies which includes involvement of local authorities in ensuring the data sharing executions across agencies through OGD portal is successful. Eventually, this leads to the issuance of Public Sector Open Data Circular in 2015 as a guideline to implement OGD at government agencies.

Malaysia is currently at the implementation phase of the smart city. Utilization of open data and IoT applications in smart city concept can act as a medium to increase efficiency of local authority's services provision [7]. Utilization of both open data and IoT can be leveraged for OGD dissemination indicating prosperous growth of an advanced city along with its citizens need. Despite the apparent benefits of adopting OGD, many government agencies are cautious and unwilling to open their data [4]. In Malaysian context, OGD initiatives show less significant progress of data publication among government agencies and this in direct correlation to Open Data Barometer (ODB) report. Malaysia's ranking in ODB report continue to drop from number 41 in 2014 to 51 in 2015 and recently dropped to 53 in 2016 out of 115 participating countries. The rate of government agencies' adoption primarily local authorities in sharing their dataset at PSOD portal indicates a very slow growth. For example, since 2014, only seventeen percent (17%) of local authorities in Malaysia have shared their datasets in PSOD portal compared to other agencies [8]. This scenario is contra to the needs of smart city implementation that require combination of open data and IoT technology at the Malaysia local authorities' level. The slow adoption to mainstream OGD does not aligned as per Gartner recommendation that adoption process is undertaken in 2 to 5 years time [9]. Not many research (only a few empirical studies conducted) that primarily focus on factors that influences adoption of OGD at local authorities level were carried out until now. A study by Matheus et. al, [10] has presented new perspectives in dissemination and incentive strategies of open data usage in local authorities, but unfortunately none on empirical study. Therefore, this research is aimed to study local authorities OGD adoption empirically and develop a new model of OGD adoption by local authorities in Malaysia, which are based on Technology-OrganisationEnvironment, Diffusion of Innovation and the Institutional theory.

3. Theoretical Background

There are several theories extensively used for exploring the adoption of technology which covers organizational and individual levels. Since this study focuses on factors influencing adoption of open government data in Malaysian local authorities, namely Diffusion of Innovation Theory (DOI) [11], Institutional Theory [12] and TechnologicalOrganizationEnvironment (TOE) framework [13].

Technology-Organization-Environment (TOE) framework

TOE has been introduced by Tornatzky and Fleischer, 1990 in their book "The Processes of Technological Innovation". The book described the process of innovation from the development, adoption phase until the implementation of an innovation within the context of a firm. TOE is the most extensive approaches adopted in examining innovation adoption which clarifies the different contextual attributes of a firm that influence adoption decision, namely technological, organizational and environmental. TOE framework is chosen for this study because the strength of this framework lies in its environmental context which is already embedded in the theory. Therefore, it becomes the better choice compared to other options as it could predict the relationship between intra-firm innovation technology adoption in an organization [14].

Diffusion of Innovation (DOI)

In general, DOI has been used to explain ICT studies technology innovation particularly on acceptance and adoption. DOI derives from theory exerted by Rogers [11] which has been studied extensively to predict and clarifies the adoption process [15]. Basically, innovation adoption is multi-dimensional and other contexts such as the environment in which it operates should be considered. However, DOI by itself only considers the attributes of technology innovation in the adoption. Due to that, DOI has been combined with other theories by many researchers to describe the adoption process in organizations [16].

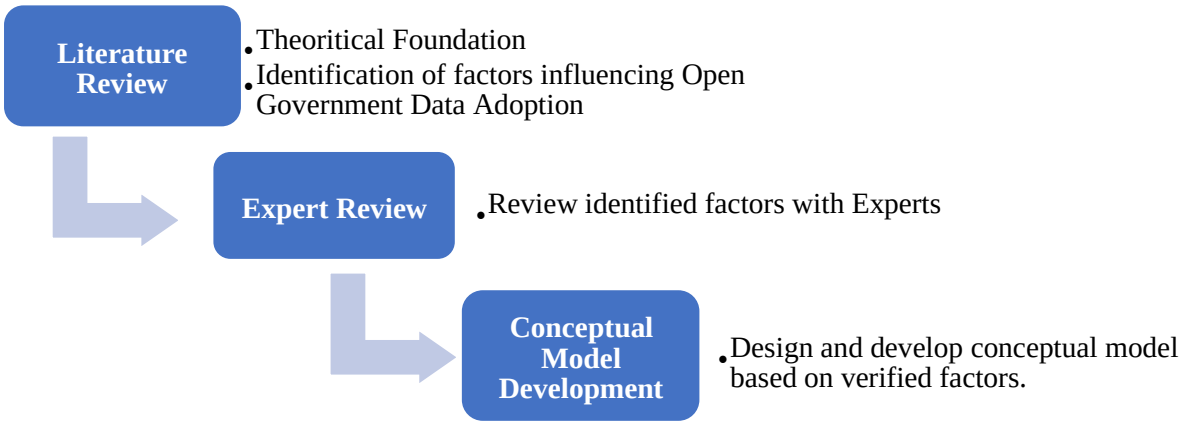
Institutional Theory

The institutional theory asserts organizations that are affected by the environment in which they operate [17]. Although Rogers' model has been used extensively to explain an organizational technological adoption studies, but its' model exclude environmental issue in the theory[16]. Since this study uses an environmental factor as one of its variables to be explored, researchers tend to use another prominent framework which is almost similar to DOI, but at the same time offer an environment as a part of the variable to be studied.

4. Methodology

Figure 1: The Process of Developing OGD Conceptual Model.

The development of the conceptual model in OGD adoption was conducted based on several steps as illustrated in Figure 1. A research question has been formulated to begin the research, and the formulated question is written next "What are the factors that can influence the adoption of OGD in the government agencies?' Then, the research steps continue by executing searching exercise on the same subject matter by retrieving information from electronic journal databases such as ACM Digital Library, IEEEXplore Digital Library, Scopus, Web of Science, Science



Direct, Emerald, Springer and snowballing technique usage. For the retrieval in the digital libraries, the initial search strings are "open data", "open government data", "public sector

information" and "adoption" which applied to the title, keywords, and abstracts of publications from the period of 2009 to 2018. Earlier research of comprehensive literature analysis on the adoption of OGD in government agencies has revealed fifteen (15) influential factors of OGD adoption which already submitted to the panel of experts for them to review as indicated in Table 1.

Table 1: List of Factors Influencing the OGD Adoption

No	Construct	Operational Definition	Source(s)
1	Perceived Benefit	Perceived benefit to adopt OGD to the organization.	[18], [19], [20], [21]
2	Complexity	Complexity to adopt OGD in the organization.	[19], [22], [23], [24]
3	Data Quality	The degree of data quality may influence the adoption of Open Government Data initiative.	[4], [23], [25], [26], [27]
4	Top Management Support	The commitment and support by top management in the organization to adopt OGD.	[28], [18], [27], [29], [30], [31]
5	Technological Competence	Consist of infrastructure and human resources, where the knowledgeable and highly skills' employees required to adopt OGD.	[1], [4], [24], [27], [32], [33]
6	Organization Culture	The positive condition within organization to adopt OGD.	[4], [19], [21], [27], [29], [34]
7	Trust	The degree of organization's concern and trust to adopt OGD.	[4], [19], [30], [32]
8	Data Governance	The degree of data governance in the organization to adopt OGD.	[19], [20], [29]–[31], [34]
9	External Pressure	Pressure from the external factors and other government agencies that influence organization decisions toadopt OGD.	[18], [27], [28], [33], [35]
10	Government Policy	The existence of policy and regulation to adopt OGD.	[1], [4], [20], [24], [27], [30], [32], [33], [35], [36]
11	Stakeholder Demand	Pressure and demand from the stakeholder that influence organization to adopt OGD	[27], [35]
12	Citizen Demand	Pressure and demand from the citizen that influence organization to adopt OGD	[4], [20], [32], [36]
13	Infrastructure	The degree of availability of ICT infrastructure to support the OGDadoption.	[27], [32]

14	Security	The degree of availability of security to adopt OGD.	[30]
15	Reward	A reward system or incentive policies that provided by top management to encourage the adoption of OGD initiative	[35][35]

Expert Review

A panel of experts is a group of specialists in their sphere who have a level of knowledge, competence, expertise and experience on a given topic [37]. They are referred to obtain the expert knowledge and opinion about a certain issue. Despite obtaining information from the extensive literature review, gathering insights from experts in the investigated field of study is needed [38]. In addition, experts review can assist researchers to confirm or invalidate each item intended to be measured [39]. The experts have been chosen to review the identified OGD influential factors which were obtained from an extensive literature review exercise. This review can help maximize the selection of suitable OGD factors specifically in Malaysian Public Sector context. Furthermore, most of the literature on OGD adoption based on the study is carried out in developed countries, therefore the local expert review is the best method to rate the relevancy of influential factors.

The semi-structured interviews session involved five (5) experts from central agency, local authorities and public university as indicated in Table 2. The central agency was selected due to the its key role in leading agencies in executing OGD implementation and the local authorities were selected as a case study for their involvement in OGD adoption. Academician views on the subject matter is deem to also carry weight in this research and hence a respondent from public university is also selected to be in the groups for interview. Each session of the interview took approximately about thirty (30) minutes to one (1) hour to complete.

Table 2: Expert Characteristic

Expert ID	Role in Current Organisation	Experience	Agency	Expertise
E1	Head of Department	33 years	Malaysian Public Sector A	Information System & Open Data
E2	Chief of Assistant Director	20 years	Malaysian Public Sector A	Information System & Open Data
E3	Deputy Director of ICT Department	19 years	Local Authority A	Core Business, System Development & Information System

E4	Head of IT Department	18 years	Local Authority B	Core Business, System Development & Information System
E5	Lecturer in Faculty of Computer Science & Information Technology (Professor)	30 years	Malaysia Public University A	Information System, Knowledge Management, Software Engineering& Computer Science

The list of fifteen (15) identified factors from the literature was evaluated and ranked by the selected experts using ranking sheet based on the scale from low to high priority. Each factor to be rank are given value from 1 to 10 by the experts. Mukred et. al, [40] defined the scale from numbers 1 to 7 are classified as low priority, while 8 to 10 are high priority. The ranking process was carried out basically to determine the main factors based on prioritization to be considered as the influencing factors of OGD adoption in the public sector [41].

5. Result and Discussion

The experts unanimously agreed on all fifteen (15) influential factors which have been identified in the literature review. Based on those identified factors, the expert reviews have resulted in a total of eleven (11) appropriate factors which strongly influence the adoption of OGD. From these ranking findings, (4) factors are excluded which two (2) factors are proposed to be combined while the remaining will be removed from the list. The list of factors after being ranked by the experts as shown in Table 3.

Table 3: Factors Ranking by the Experts

No	Factors	Factor Ranking										%
		Low							High			
		1	2	3	4	5	6	7	8	9	10	
1	Top Management Support										5	100
2	Data Quality									1	4	98
3	Data Governance									1	4	98
4	Organization Culture									2	3	96
5	Government Policy								1	1	3	94
6	Reward								1	2	2	92
7	Perceived Benefit								2	1	2	90
8	Trust							1	1		3	90
9	Stakeholder Demand								2	2	1	88
10	Technological Competence							1	1	2	1	86
11	External Pressure							1	1	2	1	86

12	Complexity							1	2	2		82
13	Citizen Demand						1	1	1	2		78
14	Security			2		1		1	1			52
15	Infrastructure			2		1	1		1			50

As per the analysis shown in Table 3, all 15 factors are arranged in descending order from highest ranking to lowest ranking which starts from top management support, data quality, data governance, organization culture, government policy, reward, perceived benefit, trust, stakeholder demand, technological competence, external pressure, complexity, citizen demand, infrastructure and lastly security factor.

All experts wholeheartedly agreed that the top management is the strongest influential factor which main role is as change agents in decision-making process, be it positive or negative decision for OGD adoption. The positive decision by top management will eventually lead to successful project implementation by providing persistent commitment and continuous support in OGD process of adoption. Furthermore, Shkabatur and Peled, [35] stated that it is vital for top management to assign reward systems or incentive policies to speed up adoption of OGD initiatives. This is in line with the expert (E1) recommendation that the reward system will encourage employees to regularly publish quality data in PSOD portal. The expert (E5) also suggested the reward system should be a moderator in the proposed conceptual model.

External pressure is one the factor that represents environmental characteristics that may contribute in creating the ability to adopt the OGD innovation. The experts (E1) and (E2) proposed the stakeholder demand and citizen demand to be consolidated into one group and to be put under the external pressure factor. This is because demand of stakeholder and citizen also have the similar characteristics to be categorized as coercive pressure, which can influence the OGD adoption. Furthermore, the expert (E3) and (E4) agreed the stakeholder and citizen are external factors in determining the success of open data innovation in Malaysian local authorities.

Meanwhile, the experts (E1) and (E2) proposed two factors to be excluded from the ranking list, namely infrastructure and security. They affirmed that the scope of ICT infrastructure and security for OGD implementation purpose are managed, maintained and entirely funded by MAMPU. Thus, government agencies only focus on providing data to be published in the PSOD portal.

6. Proposed Conceptual Model

A conceptual model was developed based on the final eleven (11) factors that experts have verified and ranked accordingly. The factors were arranged according to the dimensions being represented. As illustrated in Figure 2, the proposed model represents ten (10) hypotheses that grouped according to their scope in three different dimensions, namely technological, organizational and environmental and one hypothesis function as moderator variable.

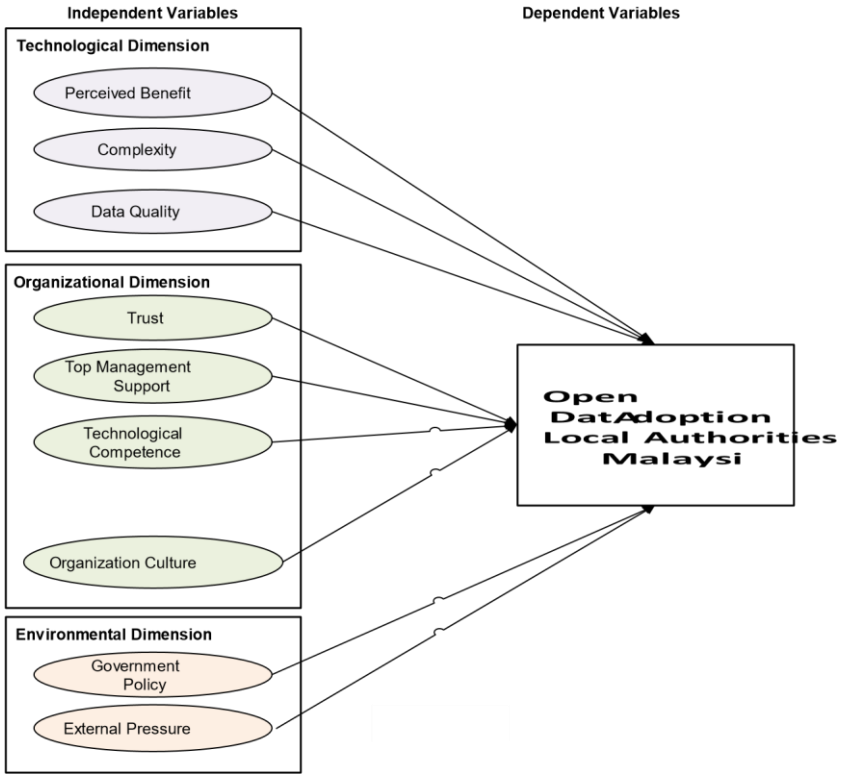


Figure 2: Proposed Conceptual Model

The description and proposed hypothesis (H) to be tested for each factor in the conceptual model are as follows:

Technological Dimension

The technology context comprises of infrastructure, processes, techniques, and expertise which drives decision making of adoption [13]. There are three (3) technological factors in relation to this study; perceived benefit, complexity and data quality.

i. **Perceived benefits**: refer to the degree in which more benefits provided by new technological innovation compared than the technology to be replaced [42]. For this study, perceived benefits refer to the extent of management recognition that OGD adoption can provide benefits to the organization. Therefore; H1: Perceived benefit is positively influence the adoption of OGD.

ii. **Complexity:** refer to the degree of difficulty associated with understanding and learning to use an innovation [11]. For this study, complexity refers to the difficulties to adopt OGD. Therefore; H2: Complexity is negatively influence the adoption of OGD.

iii. **Data Quality:** refer to quality of published data to be accessed by public. The characteristics of open data mainly include the following aspects: complete, primary, timely, accessible,

machine process able, non-discriminatory, non-proprietary, and license free. Thus; H3: Data Quality is positively influence the adoption of OGD.

Organizational Dimension

The organizational context represents the internal factors to an organization influencing an innovation adoption and implementation [13]. Organizational factors are extremely relevant and should not be left out in any organizational adoption research. This study proposed five (5) factors are considered to be organizational factors that influence the adoption of OGD.

i. **Trust:** refer to the degree of organization's concern and trust to adopt OGD. Organization's trust related to concerns of issues and the leakage of the vital information shared by them over the internet [43]. H4: Trust is positively influence the adoption of OGD.

ii. **Top Management Support:** refer to the degree to which top management understands the importance of OGD innovation and the extent to which it is involved in related initiatives. Commitment from management is vital to ensure an agency to adopt a proactive publication stance [44]. H5: Top Management Support is positively influence the adoption of OGD.

iii. **Technological Competence:** identified as important organizational factors which related to technological readiness. This study defined technology competence consist of IT infrastructure and IT human resources in the organization. IT infrastructure referred to technologies that enable adoption of OGD and IT human resources referred to employees with the knowledge and skills needed to adopt OGD. Therefore; H6: Technological Competence is positively influence the adoption of OGD.

iv. **Data Governance:** refer to the degree of data governance in the organization to adopt OGD. This study defined data governance comprises decision rights and accountabilities regulating the data publication process include data quality, data management, data privacy, data ownership and data policies. Thus; H7: Data Governance is positively influence the adoption of OGD.

v. **Organizational Culture:** is an important factor of local authority's adoption and adaptation of technologies for improved outcome [45]. Organization Culture refer to the organization's willingness and positive condition to share data to others. H8: Organization Culture toward openness is positively influence the adoption of OGD.

Environmental Dimension

TOE distinguishes how the industry, competitors, government and other near and far institutions can influence the adoption decision [13]. Environmental factor can be classified to two sectors; pressure and support. Though, for this study, researcher will use government policy and external pressure to represent environmental factors.

i. **Government Policy:** refer to the existence of legal, policy and regulation will certainly affect adoption of OGD. The implementation of any governmental project must follow the guidance with legal basis. Without support from legislatures and policymakers, cross boundary data sharing in the public sector can lose its necessary funding and resources to make projects sustainable [43]. Therefore; H9: Government Policy is positively influence the adoption of OGD.

ii. **External Pressure:** refer to the characteristics of coercive and mimetic pressure which influence organization decisions to adopt OGD. External pressure was measured through two items in this study: the degree to which local authorities were motivated to adopt OGD because citizen or stakeholder demanded it and other local authorities have benefited from adoption of OGD. Therefore; H10: External Pressure is positively influence the adoption of OGD.

Reward: refer to reward system or incentive policies provided by top management to encourage the adoption of OGD initiative. Provide incentives is one endeavor to acquire officials in government agencies to cooperate with the OGD policy innovation [35]. Therefore, H11: The positive relationship between Top Management Support and intention to adopt OGD will be stronger when the organization has Reward system.

7. Conclusion

A conceptual model was found to be the most effective and practical to be use for assessing the OGD adoption. The model is capable of measuring the relationship of organization, people and technology dimensions that influence the adoption of OGD. The follow-up research activity will develop a survey instrument using questionnaires. The proposed conceptual model and questionnaires will then need to be verified by experts from academics and relevant industry alike. In addition, a pilot study will be conducted and to be followed thereafter by actual study. The model will then be validated using statistical tools, and the results gained will provide insight for public sector leaders to enhance the quality of service delivery together with timely decision making.

8. References

[1] M. Janssen, Y. Charalabidis, and A. Zuiderwijk, "Benefits, Adoption Barriers and Myths of Open Data and Open Government," *Inf. Syst. Manag.*, vol. 29, no. 4, SI, pp. 258–268, 2012.

[2] B. Ubaldi, "Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives," *OECD*, no. 22, 2013.

[3] J. Kucera and D. Chlapek, "Benefits and Risks of Open Government Data," *J. Syst. Integr.*, pp. 30–41, 2014.

[4] S. Saxena, "Significance of open government data in the GCC countries," *Digit. POLICY Regul. Gov.*, vol. 19, no. 3, pp. 251–263, 2017.

[5] R. Huang, T. Lai, and L. Zhou, "Proposing a framework of barriers to opening government data in China: A critical literature review," vol. 35, no. 3, pp. 421–438, 2017.

[6] P. Am and J. P. Menteri, "Pelaksanaan Data Terbuka," no. September, 2015.

[7] D. R. Recupero, M. Castronovo, S. Consoli, T. Costanzo, A. Gangemi, L. Grasso, G. Lodi, G. Merendino, M. Mongiovi, V. Presutti,
S. D. Rapisarda, S. Rosa, and E. Spampinato, "An Innovative, Open, Interoperable Citizen Engagement Cloud Platform for Smart Government and Users' Interaction," *J. Knowl. Econ.*, vol. 7, no. 2, pp. 388–412, Jun. 2016.

[8] MAMPU, "Portal Data Terbuka Sektor Awam Malaysia," 2014. [Online]. Available: http://www.data.gov.my/. [Accessed: 15Aug2018].

[9] L. Colombus, "Gartner-Roundup of Big Data Forecasts and Market Estimates, 2012," 2012. [Online]. Available: https://www.forbes.com/sites/louiscolumbus/2012/08/16/roundup-of-big-data-forecasts-and-marketestimates2012/#1a63be003cdf.

[10] R. Matheus, M. M. Ribeiro, and J. C. Vaz, "Brazil towards government 2.0: Strategies for adopting open government data in national and subnational governments," *Case Stud. E-Government 2.0 Chang. Citiz. Relationships*, vol. 55, no. 11, pp. 121–138, 2015.

[11] E. M. Rogers, "Diffusion of innovation theory." New York, 1995.

[12] P. J. D. and W. W. Powell, *The New Institutionalism in Organizational Analysis*. Chicago: The University of Chicago Press, 1991.

[13] Tornatzky, L. G., M. Fleischer, and A. K. Chakrabarti, *Processes of technological innovation*. Lexington Books, 1990.

[14] J. L. Gibbs and K. L. Kraemer, "A Cross-Country Investigation of the Determinants of Scope of E-commerce Use : An Institutional Approach," *Electron. Mark.*, vol. 14, no. 2, pp. 124–137, 2004.

[15] K. D. Ferreira and C. G. Lee, "An integrated two-stage diffusion of innovation model with market segmented learning," *Technol. Forecast. Soc. Change*, vol. 88, pp. 189–201, 2014.

[16] T. Oliveira and M. Martins, "Literature review of Information Technology Adoption Models at Firm Level," *Electron. J. Inf. …*, vol. 14, no. 1, pp. 110–121, 2011.

[17] J. A. Miles, "Management and Organization Theory," *Uma ética para quantos?*, vol. XXXIII, no. 2, pp. 81–87, 2014. [18] H.-J. Wang and J. Lo, "Adoption of open government data among government agencies," *Gov. Inf. Q.*, vol. 33, no. 1, pp. 80–88, Jan. 2016.

[19] M. Beno, K. Figl, J. Umbrich, and A. Polleres, "Open data hopes and fears: Determining the barriers of open data," *Proc. 7th Int. Conf. E-Democracy Open Gov. CeDEM 2017*, pp. 69–81, 2017. [20] A. Mishra, D. P. Misra, A. K. Kar, and S. Babbar, "Digital Nations – Smart Cities, Innovation, and Sustainability," vol. 10595, no. January, 2017.

[21] T.-M. M. Yang and Y.-J. J. Wu, "Examining the socio-technical determinants influencing government agencies' open data publication: A study in Taiwan," *Gov. Inf. Q.*, vol. 33, no. 3, pp. 378–392, Jul. 2016.

[22] A. Ingrams, "The legal-normative conditions of police transparency: A configurational approach to open data adoption using qualitative comparative analysis," *PUBLIC Adm.*, vol. 95, no. 2, SI, pp. 527–545, Jun. 2017.

[23] A. Whitmore, "Using open government data to predict war: A case study of data and systems challenges," *Gov. Inf. Q.*, vol. 31, no. 4, SI, pp. 622–630, Oct. 2014.

[24] C. S. Albano and N. Reinhard, "Open government data: Facilitating and motivating factors for coping with potential barriers in the Brazilian context," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 8653 LNCS, pp. 181–193, 2014.

[25] E. Afful-Dadzie and A. Afful-Dadzie, *Digitalisation, Innovation, and Transformation*, vol. 527. Springer International Publishing, 2018.

[26] A. T. Chatfield and C. G. Reddick, "A longitudinal cross-sector analysis of open data portal service capability: The case of Australian local governments," *Gov. Inf. Q.*, vol. 34, no. 2, pp. 231–243, 2017.

[27] B. Fan and Y. Zhao, "The moderating effect of external pressure on the relationship between internal organizational factors and the quality of open government data," *Gov. Inf. Q.*, no. July, pp. 0–1, 2017.

[28] M. A. Hossain and C. Chan, "Open data adoption in Australian government agencies : an exploratory study," no. Mazumder 2014, 2015.

[29] Y. Zhao and B. Fan, "Exploring open government data capacity of government agency: Based on the resource-based theory," *Gov. Inf. Q.*, no. November 2017, pp. 1–12, 2018.

[30] P. Colpaert, M. Van Compernolle, N. Walravens, P. Mechant, J. Adriaenssens, F. Ongenae, R. Verborgh, and E. Mannens, "Open transport data for maximising reuse in multimodal route planners: a study in Flanders," *IET Intell. Transp. Syst.*, vol. 11, no. 7, pp. 397–402, 2017.

[31] I. Susha, A. Zuiderwijk, Y. Charalabidis, P. Parycek, and M. Janssen, "Critical factors for open data publication and use: A comparison of city-level, regional, and transnational cases," *J. eDemocracy*, vol. 7, no. 2, pp. 94–115, 2015.

[32] A. Takeoka and C. G. Reddick, "The role of policy entrepreneurs in open government data policy innovation di ff usion : An analysis of Australian Federal and State Governments," *Gov. Inf. Q.*, no. October, pp. 0–1, 2017.

[33] E. W. Welch, M. K. Feeney, and C. H. Park, "Determinants of data sharing in US city governments," *Gov. Inf. Q.*, vol. 33, no. 3, pp. 393–403, Jul. 2016.

[34] P. Conradie and S. Choenni, "On the barriers for local government releasing open data," *Gov. Inf. Q.*, vol. 31, no. SUPPL.1, pp. 1–8, 2014.

[35] J. Shkabatur and A. Peled, "Sustaining the open government data movement worldwide: Insights from developing countries," *Proc. 6th Int. Conf. E-Democracy Open Gov. CeDEM 2016*, pp. 172–179, 2016.

[36] S. Ganapati and C. G. Reddick, "Open e-government in US state governments: Survey evidence from Chief Information Officers," *Gov. Inf. Q.*, vol. 29, no. 2, pp. 115–122, Apr. 2012.

[37] G. J. Skulmoski and F. T. Hartman, "The Delphi Method for Graduate Research," *J. Inf. Technol. Educ.*, vol. 6, no. 1, pp. 1–21, 2007.

[38] U. Sekaran and R. Bougie, *Research Methods for Business, a Skill-Building Approach*, 7th ed. United Kingdom: John Wiley & Sons Ltd., 2016.

[39] R. F. DeVellis, *Scale development : theory and applications*, 4th ed. California: SAGE Publications, Inc, 2017.

[40] M. Mukred, Z. M. Yusof, U. A. Mokhtar, and F. Fauzi, "Taxonomic framework for factors influencing ERMS adoption in organisations of higher professional education," *J. Inf. Sci.*, 2018.

[41] A. A. Aziz, Z. M. Yusof, U. A. Mokhtar, and D. I. Jambari, "The determinant factors of electronic document and records management system (EDRMS) adoption in public sector: A UTAUT-based conceptual model," *Proc. 2017 6th Int. Conf. Electr. Eng. Informatics Sustain. Soc. Through Digit. Innov. ICEEI 2017*, vol. 2017–Novem, no. 4, pp. 1–6, 2018.

[42] T. S. H. Teo, S. Lin, and K. hung Lai, "Adopters and non-adopters of e-procurement in Singapore: An empirical study," *Omega*, vol. 37, no. 5, pp. 972–987, 2009.

[43] S. S. Dawes, "Interagency Information Sharing : Expected Ben efit s , Abstract," *J. Policy Manag.*, vol. 15, no. 3, pp. 377–394, 1996.

[44] G. Premkumar and M. Roberts, "Adoption of new information technologies in rural small businesses," *Int. J. Manag. Sci.*, vol. 27, no. 4, pp. 467–484, 1999.

[45] E. W. Welch and M. K. Feeney, "Technology in government: How organizational culture mediates information and communication technology outcomes," *Gov. Inf. Q.*, vol. 31, no. 4, pp. 506–512, 2014.