Public Servants' Perception Towards Publishing Quality and Impactful Open Data to Support Open Science Initiatives in Malaysia

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Abstract

Open Data Portal is the key intervention of e-Government initiative for information management. The Government of Malaysia has introduced the initiatives since 2015 to facilitate open data portal and strengthen transparency governance. This Open Data is crucial because it provides significant benefits to government in term of political, social, economic, operational, and technical. However, World Bank's Open Data Readiness Assessment (ODRA) for Malaysia stated that despite the clear evidence of readiness and the country's data-rich environment, it was significantly difficult to access high- quality data from Malaysia. As a result, lower scores on impact criterion in three consecutive years has landed Malaysia on 53rd of the ranking of the Global Open Data Barometer. Therefore, the objectives of this research re to determine the general perception of public servants toward open data initiatives and to identify determinants that impede the publication of open government data by the existing government entity. This research adopted qualitative method through semi-structured interview. There are six common themes of perception identified and ten common themes emerged as determinants. The result indicated that that Malaysian public servant demonstrates highly positive perception toward the initiative. It is very useful in enhancing public policy towards effective data publishing and sharing management. Subsequently may serve as input to to devise strategies to improve perceptions by addressing the perceptual biases or translating it into actionable policy to promote the success factors onto the non-providing agencies which would escalate the number of providing agencies, and consequently boost the number of data set, and eventually enhance the availability of impactful dataset to support Malaysia Government Data Sharing and Open Science initiatives.

Keywords: Open data, open government data, open science, data ecosystem, open innovation

■ 1.0 INTRODUCTION

The voluntary Open Data movement has gained noticeable momentum among governments, public institutions, and industry players (Neumaier, 2015), global expectations for significant benefits from Open Government Data (OGD) are high (Dawes et al., 2016), as evidenced by the increasing number of open data portals, program, and part of the e-government initiatives (Kalampokis et al., 2011) have been launched worldwide. Other open 'movement' i.e., Open Science, Open Development, Open Innovation, Open Government have gained traction too. Against this background, although Malaysia is not a participating countries in the Open Government Partnership, Malaysia's public sector agencies and institutions are constantly introducing new policies, strategies, approaches, and practices to accelerate the country's aspiration to become a developed nation, motivated by economics and societal goals i.e., improving the transparency, accountability of institutions, more efficient and effective public services, and the opportunity to innovatively utilize published data. For the global scene, over the last decades, digital transformation has become the engine of change, especially changing the internal process and the relationship between internal and external parties. Hence, initiatives in establishing and maintaining better relationship and effective collaboration, information and data sharing are very crucial in Malaysia as well as in other countries.

■ 2.0 LITERATURE REVIEW

2.1 Open Data Portal (ODP)

Open Data Portal (ODP) is the most prominent mechanisms among OGD initiatives. It is an online catalogue or websites that hosts a collection of datasets and provides browse, search and filter functionalities over those datasets. The proliferation of publicly disclosed (Sadiq & Indulska, 2017) of non-personal and non-confidential (McDermott, 2010) datasets and the advent of data markets (Sadiq & Indulska, 2017, as cited in Duus

& Cooray, 2016 and Elbaz, 2012) provide governments, businesses, and entrepreneurs with an unparalleled opportunity to harness the power of data for economic, social, and scientific gains. However, while the initiative starting to show significant outcomes, it is still at nascency, novel (Conradie & Choenni, 2014), with fewer gaugeable impacts (M. Canares, 2019). On daily basis at all administrative levels, Malaysian government machineries collect, store, produce and reproduce significant amount of data while rendering their business services, processes, and activities. Despite the abundance of data held by these government agencies, public servants practice restraint in releasing government classified information i.e., restricted, confidential, secret, and top secret, provisioned under Official Secrets Act 1972 which institutionalized the culture of secrecy. Reluctant to release data is frequently cited as the primary reason for actively denying user requests for data publication (Shaharudin, 2021).

As of 1st March 2018, only 2,823 of datasets (MAMPU, 2018) published on DATA.GOV.MY, the *Data Terbuka Sektor Awam* (DTSA) – the ODP flagship. At the time of writing, the portal is now contained 12,529 data sets from 394 data set suppliers – has grown by over 400% between 2018 to 2021. Additionally, DTSA now enables experimentation, as well as simple data visualization. Although DTSA is supposed to be the main building block of ODP for government data in Malaysia, Shaharudin (2020) reported it to be the least popular among open data platforms and falls short in three areas: completeness, granularity, and timeliness – according to a three-part survey among 322 local- and abroad-based researchers, who do research on Malaysia. Malaysia did not fare well in several global established evaluations of open government data (Shaharudin, 2020). Global initiatives such as the Global Open Data Index (GODI) and Open Data Barometer (ODB), have made significant contributions to assessing the availability and quality of Open Data worldwide.

The GODI provides the most comprehensive snapshot available of the state of open government data publication while ODB builds upon three areas: readiness, implementation, and impacts. To summarize, both serve as a benchmark for open data such as machine-readability, accessibility, license-free use, data discoverability, and usability, as well as providing metrics on the goal and impact. In GODI 2016/17 Report: The State of Open Government Data In 2017, Malaysia is ranked at 87 while in the 4th ODB index at 53. In addition, the 2020Asia Pacific Open Data survey, Malaysia is ranked among the lowest comparing to ASEAN counties members after Philippines, Singapore, and Indonesia (Statista 2021). Table 1 presents the comparison between Malaysia and other selected countries regionally and internationally and the number of datasets on the national ODP. Table 2 indicates the readiness, implementation, and impact of Malaysia Open Data on the global scale based on Scoring of the ODB Ranking.

Table 1: Comparison of no. of datasets and ranking between Malaysia and selected countries.

Country	Link	No. of Datasets (2018)	4th Open Data Barometer	GODI 2016/17
United Kingdom	Data.gov.uk	44,843	1	Not Available
United States of America	Data.gov	237,541	4	11
South Korea	Data.go.kr	24,960	5	Not Available
Japan	Data.go.jp	21,029	8	16
Philippines	Data.gov.ph	2800	22	54
Singapore	Data.gov.sg	1,280	23	17
Indonesia	Data.go.id	2.743	38	61
Malaysia	**Data.gov.my**	**2,823**	**53**	**87**
Thailand	Data.go.th	2,560	53	51

Source: Open Data Portals MAMPU (2018); 4th Open Data Barometer (2017) & GODI 2016/17
Report: The State of Open Government Data In 2017(2017)

Table 2: Detailed Scoring on ODB Ranking for Malaysia (2014 – 2017)

Open Data Barometer Edition / Year	Rank	Overall Score (%)	Detail scores (per 100 each)		
			Readiness	Implementation	Impact
1st Edition (2014)	-	-	-	-	-

2nd Edition (2015)	41	30.76	44	37	3
3rd Edition (2016)	51	24.60	46	17	16
4th Edition (2017)	53	28.00	53	20	19

Source: Global Open Data Barometer Rankings – The World Wide Web Foundation, 2014-2017.

Malaysian Administrative and Management Planning Unit (MAMPU) defines open data as data that is freely usable, shareable, and reusable for any purpose by citizens, government, and private entities. In 2015, the issuance of the General Circular: Open Data Implementation for the Public Sector (MAMPU, 2015) introduced the philosophy of Open Data and DTSA was initiated. The circular outlined three objectives: (1) to improve the transparency of government service delivery through accurate, fast, and relevant data sharing; (2) to increase the productivity of the country's digital economy through new industries or innovations with the involvement of the people and the business community; and (3) to put Malaysia on par with other countries in digital government initiatives. DTSA is also one of the Malaysian government's focus areas as stipulated in the Department of Statistics Malaysia (DOSM) Transformation Plan 2015 –2020, the Public Sector Information and Communication Technology (ICT) Strategic Plan 2016 –2020 and the Communications & Multimedia Blueprint 2018 –2025.

The key framework conditions for successful 'Open Data Policy Making' have been set up by the government circular which the aim to create "data value chain friendly" policy environment. The objective is to put in place the "systemic" prerequisites for effective use and re-use of data through legal and soft law measures. However, the expected impact of the Open Data policies and the development of data portals is to drive economic benefits and further transparency are showing up at a very slow to moderate pacing at our door. In order to enhance the open data initiative, MAMPU has established a long-term collaboration with the World Bank, through the Open Data Readiness Assessment (ODRA) in October 2016 and Malaysia is the first country in ASEAN to adopt the ODRA methodology. ODRA reported and recommended that the country to work on improving data quality. When the quality of OGD is low, open data users may be concerned about the quality of the data (Martin, 2014). Successful implementation of Open Data initiative requires effective participation and collaboration between several parties such as political leaders, public authorities, technologists, and users. In view of this, the Ministry of Science, Technology and Innovation together with the Academic of Science Malaysia has introduced the Malaysia Open Science Platform (MOSP) as a strategic transformative initiative to strengthen Malaysia STI's Collaborative Ecosystem to achieve Shared Prosperity Vision 2030 as well to ensure that the data can be made shared and available to everyone to access, use and share depending on the types of data.

The ISO 25012 Standard defines data quality as the "ability of data to satisfy stated and implied needs when used under specified conditions" (*ISO 25012*, n.d.). This ambiguous definition allows for numerous interpretations, particularly from the perspective of the one in need. Most extant literatures approach ODP quality from the perspective of open data platforms, but few on datasets and metadata, even little has been done to analyze and prove the impact and ensued value of these initiatives (Ubaldi, n.d.). This provides motivation and relevance to research in this area and this research exemplified insight from supply-side's general perception and practices toward implementing national open data initiatives and identify factors/determinants that foster and/or impede the transformation of government data into quality and impactful open data by the existing government entity. The remainder of the paper is divided into the following sections: The next section provides the theoretical foundation. After that, the research methodology used for data collection and analysis. Then, the results reported and discussed; and finally, additional discussion which offers few insights for policy recommendations to policymakers and managerial implications to agencies.

2.2 Theoretical Framework

In attempt to understand adoption of information technology innovation from government perspective, most literatures employ model from popular theories like theory of reasoned action (TRA), technology acceptance model (TAM), theory of planned behavior (TPB), diffusion of innovation theory (DOI), and many more. Those widely used models suggest key factors at different level, especially individuals. However, at generalize level, the process of adoption of such innovation is more complex and is influenced by multi-dimension determinants (Liang, Qi, Wei, & Chen, 2017). According to Lippert & Govindrajulu (2006) there are two models offering understanding of such perspective: Technology Organization Environment (TOE) Framework (Tornatzky and Fleischer's 1990) and Information System (IS) Success Model (DeLone & McLean's 2003). Subsequently Kurshid et al. (2020) discovered that the Tornatzky and Fleischer's (1990) TOE framework and its extensions was overwhelmingly used in organizational adoption of OGD, based on a review amongst fifty-six literatures from 2012 to May 2020. The framework asserts on three specific contexts in which organizational adoption processes take place: (1) Technological context; (2) Organizational context; and (3) External environmental context. TOE can be applied broadly for exploring the organization-level adoption of different new IT innovations in qualitative research. On the other hand, IS Success model proposes seven measures, which are structured in three layers; first layer:

'information quality,' 'system quality' and 'service quality' and second layer: affect 'user satisfaction' of the IS. Finally, two variables determine the 'individual impact' and the 'organizational impact' of the information success are at the third layer.

Tornatzky and Fleischer (1990) developed the TOE framework to describe the organizational components that affect the firm's technological adoption decisions in three specific contexts in which organizational adoption processes take place. The *technological context* relates to technologies that are available to an organization internally and externally, focusing on how technological characteristics themselves can influence adoption processes and technology that may be useful in improving organizational productivity. The *organizational context* relates to characteristics of an organization in terms of resources available to support the acceptance of the innovation, with a focus on structures and processes of an organization that constrain or facilitate innovation adoption and implementation. Other criteria include firm size and scope; the centralization, formalization, interconnectedness, and complexity of the managerial structure; and the quality and availability of the firm's human resources. The *environmental context* pertains to the arena in which an organization conducts business, including external factors such as industries, competitors, regulations, etc. These factors both constrain and support technological innovations.

The focus of this study is on the perceived usefulness in contexts identified from literatures by Liang et al. (2017): (1) Technological factors about characteristics of Information Technology (IT) innovation itself; (2) Organizational factors encompass the governmental characteristics; (3) Institutional factors are regarded as critical to an understanding of the adoption process; and (4) Environmental factors include social, cultural, economic and demographic factors. Fitting in the framework of this study which is, from government's perspective, respectively, perceptions in the context of technology, organization, institutional, and environment that determine the data stewardship, which in turn is assumed to the availability of high impact data for disclosure as illustrated in Figure 1. This study also looks at the data publication practices among government agencies and how they place emphasis or prioritize on the publication of 'high value,' 'high-impact,' 'most benefit the public' and 'most relevant' datasets.
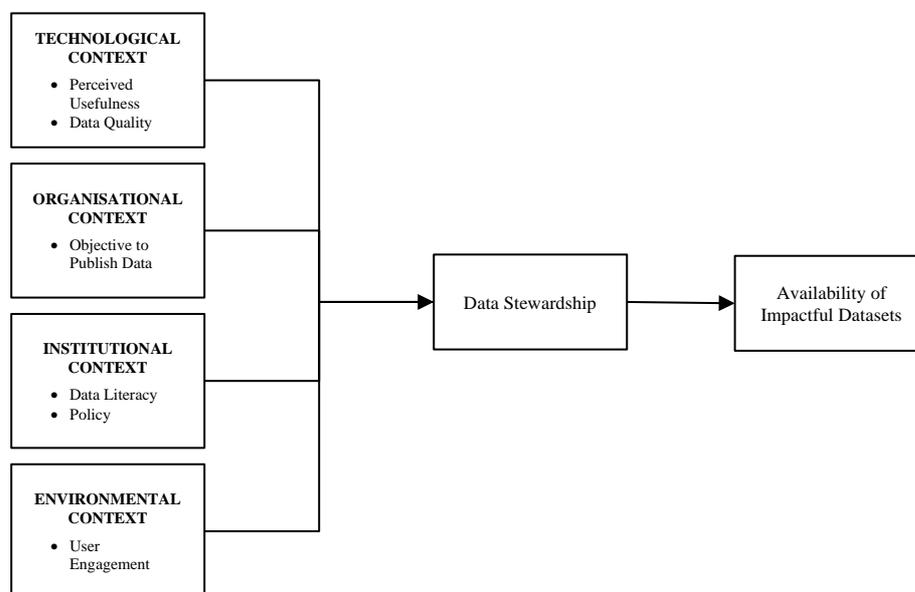

Figure 1: Theoretical Framework: Technology Organization Environment (TOE)

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2.3 Conceptual Framework

The main constructs of this study can be conceptually depicted in Figure 1 below. It consists of the perception of civil servants' (independent variable) as the implementer of the open data initiatives and the 'impact' of datasets

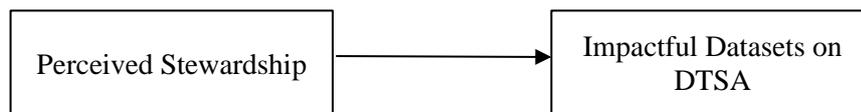published on the open data portal, as the construct of dependent variable.

Figure 2: Conceptual Framework: Relationship

The first step of the OGD initiative is identifying which datasets to be 'opened' or to be disclosed from abundant of data collected and generated every day by agencies. Motivation and decisions made in such delicate nature of data selection process is believed to be influenced by perceptions toward the initiative itself in dimensions such as readiness, usefulness, quality, etc.

■ 3.0 RESEARCH METHODOLOGY

This study constitutes qualitative approach with thematic and narrative data analysis. In selecting a representative group from the population under study, purposeful or purposive sampling technique will be used to focus on distinct characteristics of a population that are of interest. This non-probability sampling technique particularly useful in exploratory qualitative research with small number of cases which can be decisive in explaining the phenomenon of interest. In this research context, the focus is on the 151 dataset providing agencies that already involved in the actual release of datasets which accounting for around 20% from total number of government agencies. This study focuses on existing data providing agencies based on the number of datasets published on DTSA. Six providing agencies, three agencies with the greatest number of datasets and the least three have been selected as listed in table 3 below. This is to show the differential degree of perception among the two groups.

Table 3: Selected Open Data Providers Agency

Group	Agency	No. of Dataset Published
Top	Ministry of Human Resources (MOHR)	420
	Ministry of Rural and Regional Development (MORRD)	281
	Ministry of Plantation Industries & Communities	230
Bottom	*Jabatan Bantuan Guaman*	4
	Majlis Agama Islam & Adat Melayu Terengganu	4
	Education Service Commission Malaysia	3

Source: Compile from Data.Gov.my (2019)

The targeted participants included the Chief Information Officer (CIO) or Executive-level officers in charged with spearheading and leading the organization ICT strategy, those senior officers that have direct experience with the publication of the agency's data as well as the technology utilized to implement, support, and sustain the strategy for Open Data. A total of twenty-five executive officers from six agencies have participated in the interview.

Open-ended and semi-structured interview questions were devised for this study. The topics discussed during the interviews concerned with exploring the trade-offs, including the potential positive effects, the potential risks and the contextual and dataset-related variables that influence data disclosure. More specifically, questions were asked about the organization that the interviewee worked for, data publication, including reasons for publishing data, stakeholders, amounts of data published, steps taken to publish datasets, business processes, metadata, political, economic, social, and technical barriers, and potential risks of publishing data. Questions about the above-mentioned topics have been asked in each of the interviews to ensure consistency. Questions were based on the research objectives and literature reviews. Content of the questions were validated by appointed expert for adequate and precise data.

The interviews were audio-recorded and notes were taken during the interviews. The interviews provided a few new variables that were added to our initial list of variables from the literature. All recordings were transcribed and the verbatim analysis allowed extraction of significant citations by associating the data with research objectives and research questions. While thematic content analysis was used to find common patterns across a data set.

4.0 FINDINGS, RESULTS & DISCUSSION

4.1 General Perception Toward Open Data initiative on Civil Servants Initiative

Research question 1: What is the perception that public servants hold toward the Open Data initiatives in term of its context, knowledge, and process?

The first part of the analysis is answering the research question above. The interview began by assessing the effectiveness of public bodies in producing and commissioning data and information using The Open Data Maturity Model developed by the Open Data Institute and the Department for Environment, Food, and Rural Affairs. The model is organized around five themes and five levels of progression. Each theme denotes a broad area of operations within an organization and is further subdivided into activity areas that can be used to track progress. The model successfully used in assessing operational and strategic activities around open data of an organization. Hossain & Chan (2015) emphasize that organizational readiness will have positive influence on organizational adoption of open data.

Participant were shown a grid Table 4 and asked to identify the organization's levels of maturity of their open data initiative. All participants indicated that their agency somehow has already embarked on the journey and positioned themselves either at the beginning of the journey (Initial stage (2 agencies)) or have gone to few miles from starting point (Repeatable (2 agencies) or Managed (2 agencies)) yet has manage to step foot on to 'Optimizing' stage.

Table 4: Open Data Maturity Model

Stage	Description
Initial	The desirable processes are non-existent or ad hoc, with no organizational oversight.
Repeatable	Processes are becoming refined and repeatable, but only within the scope of individual teams or projects. There are no organizational standards.
Defined	Processes are standardized within the organization based on best practices identified internally or from external sources. Knowledge and best practices start to be shared internally. However, the processes may still not be widely adopted.
Managed	The organization has widely adopted the standard processes and begins monitors them using defined metrics.
Optimizing	The organization is attempting to optimize and refine its process to increase efficiency within the organization and, more widely, within its business sector.

Source: Open Data Institute (2015)

The data document, the transcription of the interview was further analyzed by identifying the important words, phrases, and paragraphs, highlighted, and compared over the transcription and against each other to come out with common themes and codes. Six themes emerged from the interviews and listed in the table below.

Table 5: Coding & Common Themes on Perception

Domain	Sub-domain	Theme	Selected Quote(s)
Perception	• Ministry's performance • Government's performance • Industry's performance • Economic performance	(1) Performance Indicator	"If we can, we want to share our successes, our achievement. It is the need of the people. For example, in any parliamentary constituency, what has the Government done, what has ministry done". "Why are we confident that the data we upload is quality data because that is the key indicator of the commodity sector. Key indicators for performance and the commodity industry that we raise his information."
	• Ministry's function and importance • Transparency of government services • Data as what has agency been working on implementation	(2) Organizational excellence corporate image & branding	"Users also need to know that the ministry has many functions where it indicates the importance of the ministry."
	• Data for policy • Policy-driven data • Political reason • For public, political and socio-economy • Parliament duty • Legislative decision making • Trend and analysis	(3) Usefulness of open data	"Government transformation plan, that the data is necessary" "The use of our data is very widespread. Convey our level, which is the usual job of parliament."
	• Alternative data sharing • Potential user • In-trend with open data technology • Big data precursor • Every data has value • Fit the purpose for local and international • MAMPU's good move • Leverage the latest technology trend	(4) Importance of the initiative	"I think it really meets the needs of MAMPU and also that we are not left behind in this open data technology."
	• Dilemma to increase number of datasets • Quality over quantity • Understanding on data quality • Fit for use data • Data is quality depends on who provide it • Data quality depends on the user.	(5) Quality over quantity dilemma	"Currently the Statistical Unit has a concern, we want data that gives an impact according to the global parameters. Giving an impact that's number one. And then number two if there are these criterias we can see the quality of data. Like ourselves, we value quality over quantity." "Another possibility, MAMPU can first study on the criteria used to achieve the barometer instead of we put a lot of data. That's what a lot of ministries are noisy right now, not keep pushing. Which is which people want, quality or quantity. "

Domain	Sub-domain	Theme	Selected Quote(s)
	• Students for study/research purpose • Researcher • Inter-ministerial policy • Global agency • Open data is not only for public, but inter-governmental	(6) Potential user	"It is also possible that this data is needed by the World Bank to publish a development report." "R&D to the university, stakeholders, local authorities". "More to students event together with G2Gs many refer to the ministry concern" "Usually MITI, Department of Statistics, MOF, MORRD, EPU, MOA also has a referral."

Based on the findings, except for one participant, it is safe to conclude that both top and bottom group providing agencies are on the same page perceiving Open Data initiative, positively high.

4.2 Determinants and Barriers in Publishing Open Data

Research question 2: What are the factors that drive (or deter) government agencies to disclose public data?

Second part of the analysis yielding ten (10) themes as per table 6 on the determinants and barriers of Open Data initiative implementation.

Domain	Sub-domain	Theme
Determinant/ Barrier	• Accessible data • Data shared is not Private & Confidential data • Published data considered as trial • Data availability	(1) Data availability
	• Accustomed to working with data • Data governance more than eight years	(2) High data literacy
	• Top-down directive • Top management involvement • Ministry's function and importance • JPM's directive • Lack of CIO's involvement • CIO's participation	(3) Strategic management of initiative and leadership
	• Participation in MAMPU's initiatives • Open data provider recognition / award • Government web portal rating	(4) MAMPU's role and responsibility

Domain	Sub-domain	Theme
	- Partial compliance of circular - Structured data governance - Collective decision lowers the risk - Team commitment - Focal point appointment - Low level of staff involvement - Not part of agency's key performance indicator - Not a priority for certain agency	(5) Governance for the initiative
	- No claim / no labelling - Fear of too detail - Hassle on providing detail data - Fear of data misinterpretation - Additional workload - Negative perception on data shared	(6) Negative sentiment
	- Public awareness on DTSA - Do not capture download number - DTSA for government - DTSA's interface is not user-friendly - DTSA not flexible - DTSA not cater data multiple form - DTSA clustering problem - DTSA interface – data hits & downloads hit	(7) DTSA
	- Data sources - Lack of data for small agency - Sensitivity of data - Data validity - No record keeping - Duplication of data - Responsible personnel - Retraining - Centralized – data management - Cut-off time	(8) Data stewardship

Domain	Sub-domain	Theme
	• Need to increase understanding among providing agency • Openness among governmental agencies is low • Openness vs. readiness • Awareness only among agents • Awareness among civil servant is low	(9) Low awareness
	• No idea on who uses the data • Data user and supplier interaction • Low public awareness	(10) No user engagement activity

Generally, Malaysian civil servant demonstrates a highly positive perception toward the initiative of open data. As perceived by the participants, their organization, somewhat, has becoming accustomed with the initiative. Some have not standardized the processes while some have widely adopted it, though without proper governance. Six common themes identified regarding this perception. There are (1) Performance indicator; (2) Organizational excellence corporate image & branding; (3) Usefulness of open data; (4) Importance of the initiative; (5) Quality over quantity dilemma; and (6) Potential user. Furthermore, ten common themes emerged for as determinants. There are: (a) Data availability; (b) High data literacy; (c) Strategic management of initiative and leadership; (d) MAMPU's role and responsibility; (e) Governance for the initiative; (f) Negative sentiment; (g) DTSA; (h) Data stewardship; (i) Low awareness; and (j) No user engagement activity.

Governments have been collecting and storing huge volumes of some of the most valuable data in the world. This, of course, emerged with technological developments during the last few decades. It has never been easier to collect data and, storage never cheaper. Computing power and widespread availability of open-source tools have made opening data, so that it can be accessed, analyzed, and distributed by anyone, within or outside government is essential to unlocking the deemed potential of data. Hence, these developments had been flowing in the vein of civil service for few years now with the introduction of the only directive, spearheaded by MAMPU. There is no question on our readiness as it has been vividly manifested and facilitated by the advancement of our ICT capability and capacity, but we have yet seen the said societal, economical, and institutional worthiness of the technology. The outset of this research is to examine the civil servants' perception toward the Government of Malaysia's Open Data initiative and explore the determinants that motivate the existing providing agencies to publish their data on the DTSA while others still at the nascent of considering heeding with the circular requirement or status quo.

Research objective 1: To examine the general perception hold by public servants toward open data initiatives.

Eight participants from the agency of Ministry of Rural and Regional (MORRD) and Ministry of Human Resources (MOHR) perceived that their organizations have reached the stage of Open Data initiative maturity of 'Managed', the highest among the participants, and next to the highest stage, 'Optimizing' based on the Open Data Maturity Model developed by Open Data Institute in 2015. The perceived stage gave the indication that those government agencies have manifested and translated open data technology in their processes and has begun to standardize it in the form of monitoring and metrics. This claim is evidenced by the setup of data-rich environment within both ministries.

The MORRD has internal data warehouse called the 'War-Room' to collect data from all corners of ministry and its agencies by quarterly. The data is then analyzed and published in an annual publication for internal use and a part of those data are published on the DTSA. Until this part of paragraph was written and published 337 dataset and the exercise of general data management has been in place for about eight years. MOHR on the other hand has already published 556 dataset (early January 2019). Most data are from Jobs Malaysia's and the ILMIA's databases. Another two providing agencies perceived that they are at the stage of 'Repeatable' – second stage of maturity that demonstrates processes are becoming repeatable within certain scope of individual teams with no organizational standards. These agencies are Ministry of Plantation Industries and Commodities (MPIC) and Education Service Commission Malaysia (SPP).

Perception is considered highly positive among these two providers toward the publication on DTSA, might be driven by the perceived usefulness of open data technology. Another perception is regarding the potential user

and re-user of their published data. Generally, all providers do not have any clue of who is using their data, how their being used and for what reason, rather than government-to-government information exchange, student, and academician. And more, they do not have any activity which engage them to the user. One remaining provider has a different tone on the initiative. Perceived as on 'Initial' stage of maturity, Jabatan Bantuan Guaman (JBG), JPM, clearly reasoned out that the published data was merely complying with Provider Based Evaluation (ProBE) criteria, an annual assessment by Malaysia Government Portals and Websites Assessments (MGPWA) in improving the quality of the online service delivery system, and Open Data is not the focus of JBG, currently.

Research objective 2: To identify factors/determinants that foster and/or impede the publication of open government data by the existing government entity.

What are the distinguishing determinants or characteristics that distinguish or differentiate top- and bottom-tier open data providers? That is the second premise of this study. By learning the providers' perception, we also learned what influence their selective attention, their characteristics, confirmation bias, perceptual error, and their mental model. All common themes of determinants identified in this study accord to what Ruijer et al. (2017) categorized as government structural barriers.
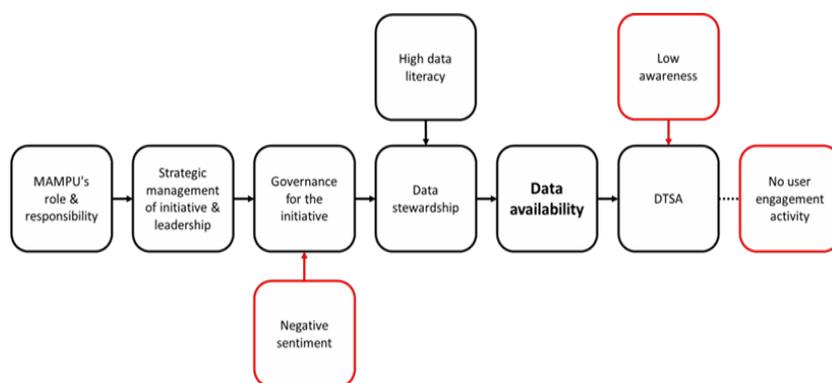

Figure 3: Determinants and barriers in the current open data initiative

Figure 3 depicts a possible 'big picture' when all determinants are combined. The first incentive is the data availability. The top providing agencies have a greater amount of data to offer than the bottom providing agencies. With a well-structured data management or data stewardship program in place within organization, as demonstrated in the data-rich work environment, data is abundant at the expense of each top providing agency.

■ **5.0 DISCUSSION**

The role and responsibility that have been played by MAMPU is very important. Besides being the national secretariat for Open Data initiative, other roles of MAMPU are operationalizing the DTSA and as policy setter. However, MAMPU needs to play the role of interventionist cum advocator even more in order to increase more awareness not only among civil servant but public and other stakeholder as well. Higher awareness will help to eradicate negative sentiment that might impede the implementation of open data.

Empowering civil servant with the ability to read, understand, create, and communicate data as information is essential too in dealing with open data is equally important as empowering the citizen (Ubaldi, n.d.). This is what data literacy means. It is not just a buzzword in this digital age of data. Despite the higher computing power that available at our expense, government personnel need to master a particular skill or to become proficient in open data technology platform, equipped with the understanding of the underlying principles and challenges of data. This will in turn empower people to comprehend, interpret, and use the data they encounter and even to produce and analyze their own data. MAMPU and agencies need to advocate more data science skills programs in their training calendar. Perception on the demand side of the open data initiative among the participants resulted with disability to identify who is using their data, how they are being used and for what purposed. Enacting a risk like previously-observed conundrum where government agencies failed to appropriately exploit innovative initiatives "due to the one-sidedness or internal orientation of the ICT-driven public sector innovation agenda.

This research offers few insights for policy recommendations to policymakers and managerial implications to agencies. Sought on the providers' perception gave us information on actual publication practices by government, what influence their selective attention, their characteristics, confirmation bias, perceptual error, and their mental model.

5.1 Demand-driven Open Data Policy

This research fancies the idea of investigating the perception from the demand-side of the initiative. It is not surprising to learn that most agencies have no idea of who are their data user. Circular above put no emphasis on empowering provider to know thy user and re-user. A sense that the open data task is complete once data is published online misses out on the greater potential of open data to function as the start of conversations and collaboration between those inside, and those operating outside of government. DTSA is purely a technical intervention that supports citizen access to data, it can also create a barrier between citizens and 'their' data.

5.2 Data Integration with Ministries and Agencies

Relevant data of different ministries and agencies must be integrated and streamlined. MAMPU need lead, enforce, and continuously monitor the performance of data management and implementation of open data.

5.3 Government Intervention and Investment in Digital Infrastructure

Government should increase investment in digital infrastructure for all agencies where currently they only been allocated with a small budget and a small ICT staff.

5.4 Replicating 'success stories' onto Non-providing Agencies

Even among the providers, as the findings suggests, Open Data initiative is well perceived by all, but one. Hence, it is unruly and misleading to apply halo perception to generalize that civil servant shares the same notion. The findings can serve as input for MAMPU and agencies, provider or not, to devise strategies to improve perceptions by addressing the perceptual biases or translating it into actionable policy to promote the success factors onto the non-providing agencies which would escalate the number of providing agencies, and consequently boost the number of data set, and eventually enhance the availability of impactful dataset.

■ 6.0 CONCLUSIONS

We can conclude that this research posits that Malaysia could achieve progress and create significant value by connecting these existing components, in particular the public sector must address several key issues related to the existing fragmented policy environment, open data challenges and the still limited synergy, integration as well as engagement around Open Data management. It also can be claimed that awareness across public sector on how specifically that value can be created and leveraged to address specific policy challenges need to be enhanced. Open data is one way of achieving open science. As such intrinsic motivation for Open Data and Open Science implementation is very low, and clear champion amongst line agencies have yet to emerge.

This research may serve as the precursor in understanding the current state of perception among public servants the general picture of how well the initiative of this emerging technology has had been perceived and adopted. This is to help to avoid pitfall of government's digital strategy and awaken a sense of urgency, draw out practical lessons on how open data can be published and used effectively to point toward how to do better. The findings not only contribute to understanding of the emerging phenomenon but also provide policy recommendations to policymakers and managerial implications to agencies. The research can be continued to cover the rest of the providing agencies that have yet to share their perspective, views on the initiative. Later the findings may be able to draw a complete picture of the adoption of the initiative which later might be augmented into a comparative study either between the non-providers; non-government agencies; or even with practices by other countries.

These findings can be useful in enhancing public policy towards effective data publishing and sharing management. Subsequently may serve as input to all relevant government agencies as well as provider to devise strategies to improve perceptions by addressing the perceptual biases or translating it into actionable policy to promote the success factors onto the non-providing agencies which would escalate the number of providing agencies, and consequently boost the number of data set, and eventually enhance the availability of impactful dataset to support Malaysia Government Data Sharing and Open Science initiatives that recently introduced. However, this research is confined to the public sector and agencies and thus it cannot be generalized to all organizations.

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