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5-2019

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### Recommended Citation

Mokobombang, Novy NRA; Gutierrez, Jairo; and Petrova, Krassie, "THE BENEFITS OF OPEN GOVERNMENT DATA USE: A CROSSCOUNTRY COMPARISON" (2019). *CONF-IRM 2019 Proceedings*. 21.  
<https://aisel.aisnet.org/confirm2019/21>

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# THE BENEFITS OF OPEN GOVERNMENT DATA USE: A CROSS-COUNTRY COMPARISON

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## ***Abstract***

Data produced by government have enormous importance; in addition to providing the information needed to run governance tasks related to internal processes, they can be used to create new sources of value by combining public datasets with private organisations' data. In this regard, many countries have implemented Open Government Data (OGD) to unlock the potential value of public data. This study is concerned with how government agencies create regulations about adopting OGD. The research examined five studies which investigated OGD programs in five different countries, and in one political and economic union. Drawing on the results of the analysis of the selected studies, it presents a list of categorised benefits based on OGD actors' perspectives. Three categories of benefits are identified, namely 1) technical and operational, 2) economic, and 3) political and societal. This study gives a practical insight into how government agencies can use innovation to create, deliver and benefit from sustainable OGD value.

## ***Keywords***

Open Government Data, OGD, dataset, OGD ecosystem, OGD benefits, user participation

## **1. Introduction**

Open Government Data (OGD) may play a significant role in strategic decision making (Magalhaes, Roseira, & Manley, 2014). Specialised open data portals may be provided by governments and other relevant organisations, to enable access and facilitate OGD use (Nicol, Caruso, & Archambault, 2013). In 2009, the USA government and the World Bank were the first to establish their open data portals. In the following years public data repositories were launched in some 20 countries (Austria, Belgium, Brazil, Canada, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Slovakia, Spain, Sweden and the United Kingdom) (Capgemini, 2013; Nicol et al., 2013). Governments around the globe are concerned with identifying the datasets that can be made available to the public (Attard, Orlandi, Scerri, & Auer, 2015), and with creating awareness about the potential impact of OGD use among citizens, researchers, business organisations, and the society as a whole.

The OGD paradigm contributes to government transparency and has offered new opportunities for developing policies and strategies that may lead to significant business, economic and social benefits. For example, in an executive order issued by the USA President in 2013 it is postulated that “*making information resources accessible, discoverable, and usable by the public can help fuel entrepreneurship, innovation, and scientific discovery-all of which improve Americans' lives and contribute significantly to job creation*” (Obama, 2013),

Some governments, states and societies are rapidly accepting the new paradigm, while others are still functioning more conservatively and traditionally. A better understanding of the implications of opening data sets, and of re-using such data may lead to a better understanding

of what “open” really means; increased awareness of the OGD potential to bring benefits may help the transition to the OGD paradigm. However, the concepts underlying OGD sharing and use are still evolving. For example, OGD may be considered from different perspectives, such as bureaucratic, technological, political, and economic (Gonzalez-Zapata & Heeks, 2015).

Open data as mentioned in the Organisation for Economic Co-operation and Development (OECD) Working Paper refers to publicly available data that are also fully accessible and usable (Ubaldi, 2013). Furthermore, the value of open data depends on their level of detail, accuracy and compatibility (McKinsey, 2014); open data have a high value if they are shared, little or no value if they are locked (Janssen, Charalabidis, & Zuiderwijk, 2012). The Open Data Institute (ODI, 2013) clarifies what open data can be defined as “good” open data, as follows:

- Linkable, so that they can be easily shared and talked about;
- Available in a standard, machine-readable format, so that they can be processed quickly;
- Readily available and consistent over time, so that users can rely on them;
- Traceable, through any processing, right back to the providers so that users can be convinced of their validity.

Open data and OGD are related to (but are different from) the recently emerged concept of big data. While open data may play a critical role in developing new business models, big data can facilitate strategic decision making within established businesses. For example, customer records held by businesses (an example of big data), are mostly used for internal purposes such as business analysis and marketing. Big data can also be open data; open data sets are designed for public use in all sectors. Big data that are also OGD have the highest potential for further analysis and use (USCCF, 2014). The interrelationships between government data, open data and big data are shown in Figure 1.

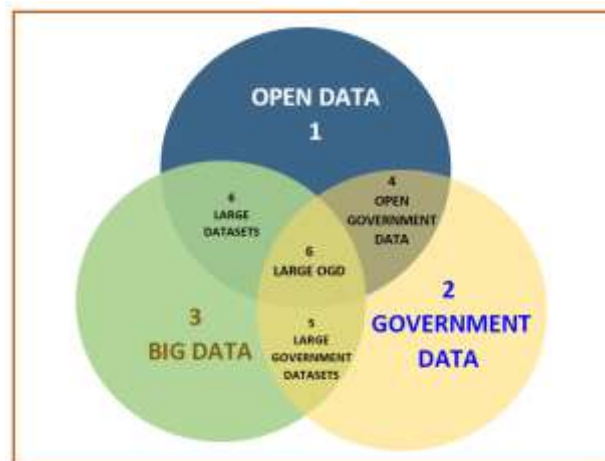


Fig 1: Big data, open data, and government data. Adapted from (USCCF, 2014)

An Open Data Barometer study performed a hierarchical cluster analysis based on data about countries’ OGD readiness and OGD impact (Foundation, 2015). It identified different patterns of engagement with OGD around the world by dividing countries into four-clusters: high capacity, emerging & advancing, capacity constrained, and one-sided initiatives. Countries classified in the high capacity cluster tend to adhere to the key principles of the open data definition, and place an emphasis on open data licensing and getting benefit from OGD. While the countries grouped in the emerging & advancing cluster do have emerging and innovative open data programs, many of them would still need to meet significant challenges related to

the adoption of OGD. All countries in the capacity constrained cluster face challenges in establishing sustainable open data initiatives because of limited government, civil society or private sector capacity, and weaknesses in data management. The one-sided initiatives cluster includes countries that have some form of open data initiative, however, they do not possess neither civil society nor private sector capacity in order to be involved in the OGD process. Other studies have also demonstrated that maintaining good open data may boost economic growth and contribute to innovation and creating public value (Janssen et al., 2012; Zuiderwijk, Janssen, Choenni, Meijer, & Alibaks, 2012).

This study aims to provide an overview of the benefits of OGD, by analysing the results of a systematic literature search for work that identified OGD benefits and investigated how government agencies created policies about adopting OGD in the context of historical policies and related obstacles. The following research questions guided the investigation:

- How can OGD benefits be classified?
- What are the impediments to OGD adoption resulting from government policies?

**2. Research design**

This research has performed a systematic literature search for studies investigating OGD initiatives. The studies were selected based on following criteria: (1) published in the last two years, (2) carried out an empirical investigation combined with a literature review, (3) focused on OGD countries found in one of the four country clusters discussed above, and (4) the findings identified the benefits experienced by different types of OGD users, and the factors influencing OGD regulation. A six-step process was applied, adapted from Machi (2016); it is shown in Figure 2. The selection was conducted in April- May 2018. Several keywords were used in various combinations, using the AND operator : ‘open government data’-‘OGD adoption’; ‘OGD adoption’-‘benefit’; ‘open government data’ - ‘benefit’ – ‘comparison’; ‘open government data’ – ‘benefit’ – ‘country’; and ‘open government data’ – ‘citizen’. The search for papers was conducted in Scopus, including the Elsevier (ScienceDirect), Institute of Electrical and Electronics Engineers (IEEE), and Google Scholar databases. The initial search resulted in 31 papers. After the duplicated studies removed, 17 publications were left. After reviewing the papers in order to identify studies that met the criteria and allowed to address the research questions, the set was reduced to five papers.

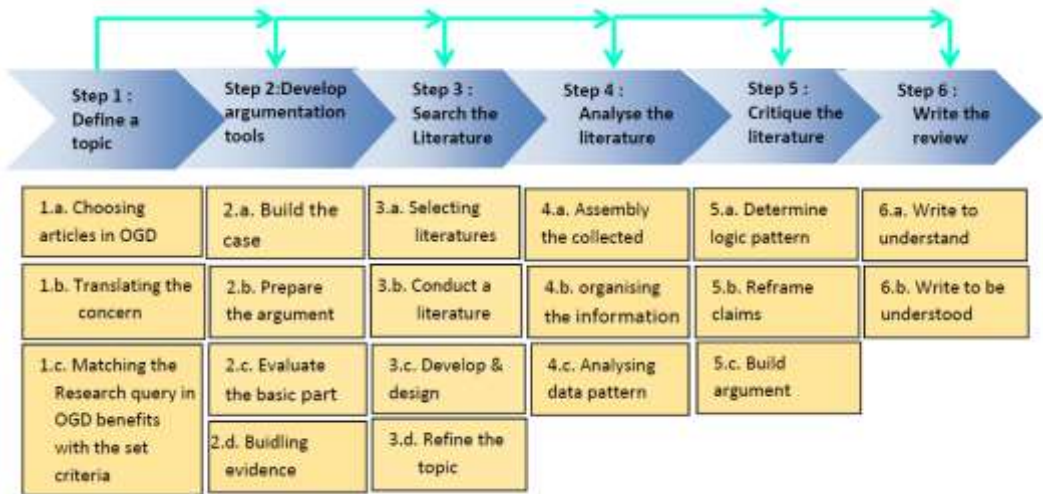


Fig 2: The framework of the research process. Adapted from Machi (2016)

Thematic analysis (Boyatzis, 1998) was used as a method for identifying, coding, and reporting themes emerging from the data provided by the papers.

Overall, the selected studies provide a comprehensive representation of the interactions characterizing the specific OGD ecosystem under investigation. While some of the implemented policies require that a top government level should mandate OGD use, in other cases OGD value is enhanced by developing mutually beneficial partnerships between government agencies and private organisations.

### 3. Findings, analysis and discussion

#### 3.1. Data analysis and findings

Information concerning the literature reviewed is presented in Table 1. It shows that all five studies met the criteria formulated above. All studies conducted an empirical enquiry (qualitative or quantitative) into OGD use including issues related to the OGD ecosystem, OGD supported business models, OGD adoption, and user perspectives on OGD benefits. Each study focuses on a specific aspect of OGD provision and use, and draws both on the literature and on the findings of the data analysis to reach conclusions and provide recommendations.

Furthermore, each study investigated OGD in a different geopolitical context. For example, in two of the studies, the countries had implemented OGD in an earlier period; two studies focused on one country (Taiwan), each from a different perspective; one of the studies investigated OGD use across the countries of the European Union (EU). A summary description is provided below.

Table 1: A summary of the five selected studies

Reference	Context	Topic	Methodology
Ahmadi Zeleti et al. (2016)	European Union	OGD business model	Qualitative , Design Science Research (DSR)
Styrin et al. (2017)	USA, Russia and Mexico	OGD ecosystem	A comparison based on textual data
Wang and Lo (2016)	Taiwan	Adoption of OGD	A research model based on the technology– organisation–environment (TOE) framework
Wirtz et al. (2017)	Germany	Citizens' expectations of OGD	An online survey
Yang and Wu (2016)	Taiwan	Socio-technical determinants of OGD	A research model based on factors extracted from a literature review

The study conducted by Ahmadi Zeleti, Ojo, and Curry (2016) using a Design Science Research (DSR) approach developed a six-value business model framework to explore the economic value provided by EU-based OGD. In their study, Styrin, Luna-Reyes, and Harrison (2017) focused on a comparative approach in order to extract the similarities and discrepancies of the OGD ecosystems in the USA, Russia and Mexico, based on policy and practice background. The research model developed by Wang and Lo (2016) was used to investigate the correlations among perceived benefits, organisational readiness, and external pressures, by examining Taiwan government agencies in the early stage of OGD initiatives. The research by Wirtz, Weyerer, and Rösch (2017) examined how German citizens gained value from OGD as determined by their usefulness and ease of use. Finally, Yang and Wu (2016) developed a research model to investigate the factors influencing Taiwan government agencies' behaviour and intention to implement OGD.

The texts of the selected studies were searched and coded for meanings indicating OGD benefits that may influence OGD adoption, and the impact of OGD related initiatives as perceived by the content-specific actors involved in the OGD ecosystem. The emerging OGD benefits were classified as technical and operational (Table 2), economic (Table 3), and political and societal (Table 4).

Table 2: Technical and operational OGD benefits (derived from three studies)

Benefit code	Description	Beneficiary (actors/bodies)	Source
T01	Enhancing interoperability and openness possibility; legally permissible	USA citizens	Styrin et al. (2017)
T02	Ensuring that released data are easy to find, accessible, and usable	USA eCitizens, government agency, private companies	Styrin et al. (2017)
T03	Enhancing citizen participation by collecting feedback to define data sets quality (as in the datos.gob.mx portal)	Mexico citizens	Styrin et al. (2017)
T04	Creating a regular procedure to carefully survey and check their data repositories as information flow is complex	Taiwan government agencies	(Yang & Wu, 2016)
T05	Providing opportunity for government agencies to use other agency datasets of different levels under the Taiwan bureaucratic system	Taiwan government agencies	(Yang & Wu, 2016)
T06	Enhancing organizational capability has a positive impact on the government agencies' motivation to participate in open data movement	Taiwan government agencies	(Yang & Wu, 2016)
T07	Increasing citizens' trust in open data quality by enhancing transparency of OGD	German citizens	(Wirtz et al., 2017)

The tables show the complexities involved in categorising and analysing OGD benefits, as some benefits could overlap or could be categorized as subsets of others. However, the presented benefits as organized into three categories allow this study to identify some broader patterns of the ways OGD can be used by different actors.

### 3.2. Discussion

As the data show, user benefits from promoting OGD are commonly described as gaining citizens' trust, and participation. For instance, the benefit coded as T02 (Table 1) implies that USA citizens expect regularly maintained, high-quality data; the quality and the permanency of open data are the main obstacle to gaining benefits from OGD use. Similarly, the benefits for citizens and government agencies described under codes T03 and T04 respectively highlight the importance of getting feedback from users and checking the data repository, as essential requirements of the OGD process. These findings indicate that adopting a collaborative approach to promote OGD by setting up appropriate policies to ensure OGD quality would strongly enhance the OGD value experienced by OGD users.

Additionally, a cross-country analysis of the data in the five studies shows that the type of OGD benefits are broadly related to the maturity level of the respective OGD ecosystem. For example, trendsetter OGD adopters USA and Russia already reap some economic benefits that have a financial impact, such as expanding the business portfolios of private companies (E06, E07, and E08), and creating new facilities for citizens (E02, E03 and E04). Interestingly,

countries such as the USA and Russia have been able to gain significant savings in their health budgets as a result of the collaboration with open data analysts by finding new methods to treat illnesses.

Table 3: Economic OGD benefits (derived from two studies)

Code	Descriptions	Beneficiary (actors/bodies)	Source
E01	Analysing the health data of 11 million USA prisoners could reveal how to reduce recidivism; traversing the jails of the criminal justice system for mental health problems	USA health experts and citizens	Styrin et al. (2017)
E02	Empowering citizens to involve in data-driven decision-making by using USA open data to choose a tertiary study pathway	USA citizens	Styrin et al. (2017)
E03	Improving USA government data usability to promote fair housing	USA citizens, housing agency, real estate companies	Styrin et al. (2017)
E04	Allowing USA citizens to use OGD to choose better health-care providers based on their circumstances	USA citizens	Styrin et al. (2017)
E05	Using Government health data to find the best therapies for treating cancer and other illnesses fitting the patient's genetics and lifestyle	Joe Biden's Cancer Moonshot project ; the Precision Medicine Initiative US	Styrin et al. (2017)
E06	Moscow authorities have an agreement for transport data with Yandex-the leading Russian multi-national company specialising in Internet-related services and products	Yandex (private company), IT Companies, IT users	Styrin et al. (2017)
E07	Spark Interfax-(the largest information analyst company in Russia) utilises Russian OGD such as open procurement data, open budget data, and federal registry to create mashups and useful information for their marketing.	Russian Commercial company	Styrin et al. (2017)
E08	Enhancing entrepreneurs' participation through Budget Apps competition which was attended by developers, data activists, civil servants and budget experts.	Russian entrepreneurs, finance companies	Styrin et al. (2017)
E09	Using open budget data to create map visualisations of historical facts and trends information	Russian entrepreneurs	Styrin et al. (2017)
E10	City Service Development Kit (CitySDK) are working with pilot cities to harmonise APIs that have standard approaches to how APIs to be rapidly developed, scaled for local cities portal.	API developers, local cities	Ahmadi Zeleti et al. (2016)
E11	Governments have opportunities of gaining the benefit of saving ; how to get money by becoming a provider for the city.	government cities	Ahmadi Zeleti et al. (2016)
E12	Providing access to allow more businesses to have access to open data products through APIs.	API provider, API developer and private organisations	Ahmadi Zeleti et al. (2016)
E13	Involving other parties who would benefit from having up-to-date and good quality open data	Publishers, lawyers, academics, and Government agencies	Ahmadi Zeleti et al. (2016)

Table 4: Political and societal OGD benefits (derived from four studies)

Code	Description	Beneficiary (actors/bodies)	Source
S01	Promoting the “management of Government information as an asset.”	USA government	Styrin et al. (2017)
S02	Boosting citizen commitment with Data-driven journalism, since there was a lack of analytical skills in the media industry.	NGOs and Journalists in Mexico	Styrin et al. (2017)
S03	Including citizen participation in several consultations about transparency	Mexico citizens	Styrin et al. (2017)
S04	Maintaining citizen collaboration and participation through a broad spectrum of public online tools, such as public social media	German Citizens and public social media	Wirtz et al. (2017)
S05	Creating a political community for sharing, commenting on and reviewing relevant open content by stakeholders, government and citizens, networking through public social media	German citizens	Wirtz et al. (2017)
S06	Expanding Word-of-mouth (WOM) communication to the digital network as a recent benefit of OGD	German Citizens and government agencies	Wirtz et al. (2017)
S07	Providing a critical foundation for effectively involving citizens into governmental decision-making	German government agencies	Wirtz et al. (2017)
S09	Revising the administrative systems of government agencies at the same level	Taiwan government agencies	Wang and Lo (2016)
S10	Experiencing significant effects of organisational readiness in a democratic nation such as Taiwan	Taiwan government agencies	Wang and Lo (2016)
S11	Organisational readiness levels for IT infrastructures and top management ensure benefits from the release of government data for government agencies and policy makers	Taiwan Policy practitioners, and government agencies	Wang and Lo (2016)
S12	Developing government transparency and getting more participation and collaboration from citizens	Taiwan government agencies and citizens	Yang and Wu (2016)
S13	Developing the efficiency and effectiveness of government agencies; work culture	Taiwan government agencies	Yang and Wu (2016)

#### 4. Conclusions, limitations and further research

Addressing the research questions formulated earlier, this study identified and categorized OGD benefits as technical and operational, economic, and political, and societal; the classification is based on the type of value provided to the actors. The five selected studies provided an opportunity to gain an initial understanding of how OGD may generate value for providers and data users. Findings revealed that OGD programs in the countries and regions studied offer not only benefits by improving public service delivery, and the transparency and efficiency of internal operations, but may also create economical, technical, operational and societal benefits. Furthermore, OGD provision and use involved different actors in a variety of roles and a wide range of opportunities.

The study provides a theoretical contribution by showing that technical and operational OGD benefits reflect the fact that users need government agencies, as the OGD provider, to maintain high-quality data to optimise their value. Facilitating networking among actors through the building of an ecosystem can create a direct economic benefit to governments, private



companies, and citizens. Thus, OGD programs may create additional significant value by providing a model of how top government levels (in their role of policymakers), interact with government agencies that are dealing with OGD.

This study has several limitations. First, the variability of contexts, the maturity of OGD adoption, top-level policies, and the ecosystems occupied by the OGD-using organisations limit the reliability of the research. Another limitation is the fact that the surveyed studies dealt with two quite different types of OGD adoption, i.e., experiences related to OGD use in leading OGD countries vs experiences of early-stage OGD adopters; this may have led to a somewhat fragmented picture. However, this study attempted to minimise the limitations by applying the same steps for all cases and applying a simple one-level coding scheme for categorising the benefits.

Future research has been planned to examine more OGD initiatives in other countries, applying a thematic analysis approach and code development with complex variables. Using additional recent studies will reveal additional trends and issues related to OGD value creation considering that during the last four years OGD adoption has grown significantly due to the popularity of data-driven approaches in all organisational aspects.

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