



Delft University of Technology

## Why open government data initiatives fail to achieve their objectives categorizing and prioritizing barriers through a global survey

Zuiderwijk-van Eijk, A.M.G.; Reuver, Mark de

### DOI

[10.1108/TG-09-2020-0271](https://doi.org/10.1108/TG-09-2020-0271)

### Publication date

2021

### Document Version

Accepted author manuscript

### Published in

Transforming Government: People, Process and Policy

### Citation (APA)

Zuiderwijk-van Eijk, A. M. G., & Reuver, M. D. (2021). Why open government data initiatives fail to achieve their objectives: categorizing and prioritizing barriers through a global survey. *Transforming Government: People, Process and Policy*, 15(4), 377-395. <https://doi.org/10.1108/TG-09-2020-0271>

### Important note

To cite this publication, please use the final published version (if applicable).  
Please check the document version above.

### Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

### Takedown policy

Please contact us and provide details if you believe this document breaches copyrights.  
We will remove access to the work immediately and investigate your claim.

# Why open government data initiatives fail to achieve their objectives: categorizing and prioritizing barriers through a global survey

Anneke Zuiderwijk, Delft University of Technology

Mark de Reuver, Delft University of Technology

## Structured abstract

- *Purpose.* Existing overviews of barriers for openly sharing and using government data are often conceptual or based on a limited number of cases. Furthermore, it is unclear what categories of barriers are most obstructive for attaining open data objectives. This article aims to categorize and prioritize barriers for openly sharing and using government data based on many existing Open Government Data Initiatives (OGDIs).
- *Design/methodology/approach.* This study analyzes 171 survey responses concerning existing OGDIs worldwide.
- *Findings.* We found that the most critical OGD I barrier categories concern (in order of most to least critical): 1) functionality and support, 2) inclusiveness, 3) economy, policy, and process, 4) data interpretation, 5) data quality and resources, 6) legislation and access, and 7) sustainability. Policymakers should prioritize solving functionality and support barriers and inclusiveness barriers because we found that these are the most obstructive in attaining OGD I objectives.
- *Practical implications.* The prioritization of open data barriers calls for three main actions by practitioners to reduce the barrier impact: 1) open data portal developers should develop advanced tools to support data search, analysis, visualization, interpretation, and interaction; 2) open data experts and teachers should train potential users, and especially those currently excluded from OGDIs due to a lack of digital skills, and; 3) government agencies that provide open data should put user-centered design and the user experience central to better support open data users.
- *Originality and research implications.* This study contributes to the open data literature by proposing a new, empirically-based barrier categorization and prioritization based a large number of existing OGDIs.

**Keywords:** Open data, open government data, OGD, initiative, barriers, categories, prioritization

## 1. Introduction

Governmental agencies worldwide are setting up open data initiatives to share data through online platforms (Zhenbin et al., 2019; Ubaldi, 2013). Non-Governmental Organizations, universities, and others use this data and combine it with other data to obtain benefits, such as increasing transparency and collaboration. We refer to such initiatives as Open Government Data Initiatives (OGDIs). An OGDI example is the integration of Open Government Data (OGD) about social demographics and geography with scraped newspaper and radio data about hidden grave mentions in Mexico to predict which counties are most likely to have hidden mass graves (Onuoha, 2017). Another example concerns the initiative entitled ‘USA Facts’, which combines, aggregates, and presents OGD concerning the American population, government’s finances, and the government’s impact on society (USA Facts Institute, 2017; USAFacts.org, 2019).

Numerous other OGDIs have been initiated worldwide; however, they rarely attain the original objectives (Zuiderwijk et al., 2018). Both barriers for openly sharing data and for using the shared data hinder the realization of OGDI objectives. On the data provision side, barriers include the threat of liability for data quality (Barry and Bannister, 2014; Beno et al., 2017), the risk of releasing privacy-sensitive information (Van Veenstra and Van den Broek, 2013; Eckartz et al., 2014; Albano and Reinhard, 2014) and the fear of open data users drawing false conclusions (Barry and Bannister, 2014; Conradie and Choenni, 2014). Examples of user side barriers are incomplete datasets (Saxena and Muhammad, 2018) and data quality concerns (Martin, 2014). The high number of identified barriers for attaining OGDI objectives raises the question of whether specific barriers are more obstructive in achieving OGDI objectives than others. Knowing whether specific barriers are more obstructive is particularly important for open data policymakers to understand better what obstacles to focus on in their efforts to support the attainment of OGDI objectives to generate value ultimately.

However, despite a few exceptions (e.g., Parung et al., 2018; Ma and Lam, 2019), research into the prioritization of open data barriers is scarce. Because of the lack of understanding concerning what barriers policymakers should focus on first, they may be addressing obstacles that are not very obstructive for OGDI value generation. Furthermore, despite a few exceptions (Smith and Sandberg, 2018; Parung et al., 2018), existing categorizations and prioritizations of open data barriers are often either conceptual or based on a limited number of cases. They are generally not based on the quantitative analysis of a large number of real OGDIs. It is currently unclear whether the limited number of OGDI cases studied in previous research represents a larger group of OGDIs, and whether the identified barriers are supported on a larger scale. If not, this may result in policymakers addressing OGDI barriers that are, in reality, less obstructive than hypothesized, while not addressing the more obstructive barriers. Consequently, this may lead to not fully exploiting the potential value of OGDIs and policymakers wasting efforts and resources.

This study aims to categorize and prioritize barriers for openly sharing and using government data based on a large number of existing OGDIs. We use Exploratory Factor Analysis and apply this to a set of 171 OGDIs. This study's main contribution to the open data literature is that it provides an empirically-informed categorization and prioritization of barriers, adding insights to the many existing conceptual studies on OGD barrier. Furthermore, our categorization of barriers is derived from many existing OGDIs, making it possible to test whether findings from previous studies, which often focus on fewer cases, are more widely supported.

## 2. Literature review: barriers for attaining OGD objectives

Recourses for the realization of OGDs are limited, and policymakers need to choose what obstacles to address. Hence, we examine what most obstructive OGD barriers policymakers should prioritize. To create a prioritization, an overview of OGD barriers is needed first, as presented in this section. This study is exploratory and data-driven, and we want to be open to a wide range of OGD barriers. Instead of using dazzling or restricting base theories to develop a theoretical framework, we derive many possible barriers from the literature and use them to build our questionnaire (Section three).

We used the keywords 'open data', 'open government data', 'barrier', and 'obstacle' in various combinations to find literature relevant to this research (literature search updated in Spring 2020). We first looked for references in the Digital Government Reference Library (DGRL) version 15.5 of the University of Washington (Scholl, 2019), a digital library containing 12,546 references of peer-reviewed research in the study domains digital government, digital governance, and digital democracy. This library includes many references to OGD-related research. Our search in the DGRL resulted in 74 identified articles, of which we selected 29. From the identified papers, we included findings resulting from empirical research. We excluded findings from literature reviews since we look for barriers experienced in practice rather than envisioned, conceptual, or potential barriers.

Besides, we searched for papers in Scopus, including Sage, Emerald, Elsevier (ScienceDirect), Springer, Taylor & Francis, Wiley Blackwell, and Institute of Electrical and Electronics Engineers (IEEE). Using the same keywords for our DGRL search, we identified 67 articles in Scopus and examined the 30 most relevant ones, as determined by Scopus. Our selection of DGRL-articles already included many of the reviewed articles. In addition to the items already selected after our DGRL search, we selected eleven more papers identified through Scopus.

Eventually, we selected 40 articles in total, from which we identified 34 barriers (see Table 1). In defining the barriers, we stayed relatively close to the phrasing used in the articles. The literature review shows that OGD barriers have been studied extensively, and various barrier categorizations have been proposed. It is essential to distinguish between obstacles for openly sharing data and those for using the shared data. Concerning OGD sharing barriers, Barry and Bannister (2014) refer to economic, technical, cultural, legal and administrative, and risk-related barriers.

Furthermore, Martin (2014) distinguishes barriers related to digital technology, user practice, public management practice, institutions and resources, and between contentious and uncontentious obstacles in each of these categories. Yet another categorization of open data barriers has been created by Janssen et al. (2012). They distinguish institutional, task complexity, use and participation, legislation, information quality, and technical barriers for opening up government data. Within the various categories, barriers for openly sharing government data are mentioned in the literature, including the threat of liability for data quality (Barry and Bannister, 2014; Beno et al., 2017), the risk of releasing privacy-sensitive information (Van Veenstra and Van den Broek, 2013; Eckartz et al., 2014; Albano and Reinhard, 2014), the fear of open data users drawing false conclusions (Barry and Bannister, 2014; Conradie and Choenni, 2014) and the risk-averse culture of governmental organizations which avoids openly sharing the data (Wirtz et al., 2016; Martin, 2014).

<b>Open data barriers</b>	<b>Sources</b>
<b>Risk of releasing privacy-sensitive information</b>	Albano and Reinhard (2014); Barry and Bannister (2014); Cranefield, Robertson, and Oliver (2014); Eckartz et al. (2014); Ma and Lam (2019); C. Martin (2014); S. Martin, Foulonneau, Turki, and Ihadjadene (2013a); S. Martin et al. (2013b); van Loenen, Ubacht, Labots, and Zuiderwijk (2017); Van Veenstra and Van den Broek (2013); Wang, Shepherd, and Button (2019)
<b>Threat of liability for data quality</b>	Barry and Bannister (2014); Beno et al. (2017); Cranefield et al. (2014)
<b>Time consumption in gaining permission and access to and reproducing data</b>	Cranefield et al. (2014); Saxena (2018b); Shao and Saxena (2019); Smith and Sandberg (2018); Wiczorkowski (2019)
<b>Only problems specific to some communities are handled, which demotivates others</b>	Dawes, Vidiasovab, and Parkhimovichc (2016); van Loenen et al. (2017)
<b>Data is being misused (potentially), which discourages developers</b>	Barry and Bannister (2014)
<b>Citizens' ideas are not taken on board in government administration</b>	Reggi and Dawes (2016); Smith and Sandberg (2018)
<b>The open data initiative tends to be a one-time pilot and lacks sustainability</b>	Beno et al. (2017); Cranefield et al. (2014); Luna-Reyes and Najafabadi (2019); S. Martin et al. (2013a, 2013b); Shao and Saxena (2019)
<b>Risk-averse culture avoids new initiatives (including opening data)</b>	Barry and Bannister (2014); Beno et al. (2017); Ma and Lam (2019); C. Martin (2014); Wirtz et al. (2016)
<b>Value-less data published leading to wasted government resources</b>	Beno et al. (2017); Dawes et al. (2016)
<b>Information is available at many different (unknown) places</b>	Berntzen et al. (2018); Kalampokis, Tambouris, Karamanou, and Tarabanis (2016); S. Martin et al. (2013a, 2013b); (Toots et al., 2017)
<b>Heterogeneous terminologies (and formats) are used</b>	Albertoni, Martino, and Podestà (2014); S. Martin et al. (2013a, 2013b); Saxena (2018b)
<b>Raw data looks irrelevant to users who are not data specialists</b>	Albano and Reinhard (2014); Ma and Lam (2019)
<b>Misinterpretation of the available information results in wrong conclusions</b>	Barry and Bannister (2014); Beno et al. (2017); Conradie and Choenni (2014); S. Martin et al. (2013a, 2013b); Saxena (2018a); Wang et al. (2019)
<b>Difficult to use information from combined sources</b>	Barry and Bannister (2014); Beno et al. (2017); De Donato et al. (2018); Young and Yan (2017)
<b>Chance of contradicting outcomes from data sources</b>	Barry and Bannister (2014); Kalampokis et al. (2016)
<b>Data is not of sufficient quality to use</b>	Albano and Reinhard (2014); Beno et al. (2017); Eckartz et al. (2014); Ma and Lam (2019); C. Martin (2014); Ruijter, Grimmelikhuijsen, van den Berg, and Meijer (2018); Saxena (2018a); Saxena and Muhammad (2018); Shao and Saxena (2019); Wang et al. (2019); Young and Yan (2017)
<b>Not easy to judge the quality of the information</b>	Beno et al. (2017); S. Martin et al. (2013a, 2013b); Saxena and Muhammad (2018); Wiczorkowski (2019)
<b>Biased data lead to unintended or wrong</b>	S. Martin et al. (2013a, 2013b); Saxena (2018a); Saxena and Muhammad

<b>results</b>	(2018); Young and Yan (2017)
<b>Public does not see the benefits of usage</b>	Albano and Reinhard (2014); C. Martin (2014); Toots et al. (2017)
<b>Difficult to see returns from investment</b>	Conradie and Choenni (2014); Cranefield et al. (2014); Donker and van Loenen (2016); Eckartz et al. (2014); S. Martin et al. (2013a, 2013b); McBride, Toots, Kalvet, and Krimmer (2018); Shao and Saxena (2019); Smith and Sandberg (2018); Van Veenstra and Van den Broek (2013)
<b>Using raw data takes lot of time</b>	Saxena (2018a); Shao and Saxena (2019); Smith and Sandberg (2018)
<b>Not all groups can use or participate on the platform (digital divide)</b>	Berntzen et al. (2018); Gascó-Hernández et al. (2018); S. Martin et al. (2013a, 2013b); Matheus and Janssen (2017); Veeckman and van der Graaf (2015)
<b>Lack of skills excludes some groups</b>	Dawes et al. (2016); Eckartz, van den Broek, and Ooms (2016); Gascó-Hernández et al. (2018); Ma and Lam (2019); C. Martin (2014); S. Martin et al. (2013a, 2013b); Saxena and Muhammad (2018); Shao and Saxena (2019); Toots et al. (2017); Veeckman and van der Graaf (2015)
<b>Government might fear a decrease in trust due to transparency</b>	Barry and Bannister (2014); Wirtz et al. (2016)
<b>Lack of (technical) resources to support data publication</b>	Barry and Bannister (2014); Beno et al. (2017); Dawes et al. (2016); C. Martin (2014); McBride et al. (2018); Najafabadi and Luna-Reyes (2017); Shao and Saxena (2019)
<b>Lack of knowledge among users</b>	Gascó-Hernández et al. (2018); Gerunov (2017); Shao and Saxena (2019)
<b>Lack of expertise of citizens to participate in the open government initiative</b>	Gascó-Hernández et al. (2018); Reggi and Dawes (2016)
<b>Lack of advanced search support</b>	Beno et al. (2017); Wiczorkowski (2019); Young and Yan (2017)
<b>Lack of data analysis support tools</b>	Saxena (2018a, 2018b); Young and Yan (2017)
<b>Lack of data visualization and interpretation tools</b>	Saxena (2018a, 2018b); Saxena and Muhammad (2018)
<b>Lack of interaction mediums on the platform</b>	Berntzen et al. (2018); Dawes et al. (2016); S. Martin et al. (2013a, 2013b); Ruijter et al. (2018); Saxena (2018a); Shao and Saxena (2019); Toots et al. (2017); Young and Yan (2017)
<b>Lack of helpdesk and other support</b>	Beno et al. (2017); Matheus and Janssen (2017); Saxena (2018b)
<b>No (institutional) policy for publishing government data</b>	Barry and Bannister (2014); Eckartz et al. (2014); Ma and Lam (2019); Nugroho, Zuiderwijk, Janssen, and Jong (2015); Parycek, Schöllhammer, and Schossböck (2016); Shao and Saxena (2019); Van Veenstra and Van den Broek (2013)
<b>No process for dealing with user input</b>	Beno et al. (2017); Berntzen et al. (2018); Cranefield et al. (2014); Reggi and Dawes (2016); Ruijter et al. (2018); Saxena (2018b)

*Table 1: Barriers for attaining open data objectives as identified in the literature.*

The literature also suggests various categories of OGD use barriers. For example, Zuiderwijk et al. (2012) identify open data use barriers in ten categories: availability and access, findability, usability, understandability, quality, linking and combining data, comparability and compatibility, metadata, interaction with the data provider, and opening and uploading. As another example, Martin (2014), who studies both the provision and use of OGD, refers to barriers in the categories of data and digital technologies, user practices, public management practices, institutions, and resources. Specific barriers for OGD use identified in the literature include incomplete datasets (Saxena and Muhammad, 2018), the lack of contextual metadata (Martin, 2014), the fragmentation of datasets over multiple websites (Berntzen et al., 2018; Toots et al., 2017; Martin et al., 2013) and concerns about the quality of open data (Martin, 2014).

## 3. Research design

### 3.1 Approach

Section two provided an overview of OGD barriers. To better understand whether some of these barriers are more obstructive in realizing OGDIs's value than others, we used a questionnaire to collect data from a large number of OGDIs worldwide. Within the setting of a free Massive Open Online Course (MOOC), we asked respondents to assess a specific OGD, either in which they were directly involved or interested. They also collected (public) information about this OGD and then evaluated the relevance of barriers. By having a respondent focus on one specific OGD, we aimed to have a clear and comprehensive example of a real-life OGD, contributing to the validity of responses (Myers and Newman, 2007).

We used a MOOC on open data and open government to distribute our questionnaire all over the world. Delft University of Technology taught the five-week MOOC, provided through one of the largest online learning platforms. We distributed the questionnaire at multiple moments to collect data concerning as many OGDs as possible: in March/April 2016 and in April/May 2017. Our research's paramount goal was that the collected data reflects OGDs rather than the respondents' personal opinions. We distributed the questionnaire among people who either specialize in or are interested in open government and OGD. Furthermore, the MOOC educated all respondents on OGD barriers, and respondents obtained sufficient information about OGDs to assess them. As part of the MOOC, the respondents investigated the OGD they evaluated using websites, available reports, and other information sources. Respondents used a structured template to identify the information needed. They also had to reference the website related to the OGD, which was checked by the researchers.

### 3.2 Sample

From a total of 382 collected survey responses, we first removed many cases that did not concern OGD specifically, as respondents were also allowed to choose open government-related cases that did not involve OGD. Then we removed several cases with missing information about the OGD or answers to the questionnaire. We also took out a few questionable cases in which respondents gave the same response to all the questions (e.g., each question answered with 'neutral' or 'agree'). When multiple evaluations about a specific OGD were available, we only kept the respondent's response with the highest level of involvement. In total, we removed 211 cases so that the final dataset consisted of 171 responses: 118 OGDs (69%) from the MOOC run in 2016, and 53 OGDs (31%) from the MOOC run in 2017. The final dataset concerning the OGDs from both 2016 and 2017 is publicly available (see <https://doi.org/10.4121/13142885>).

Table 2 provides respondent information. The percentages show the proportion of a particular characteristic relative to the complete dataset. Table 2 shows that most respondents have at least a bachelor's degree. Nearly three-quarters of all respondents are employed. Most respondents (58%) were involved in the OGDIs they assessed, and thus, we assumed they had sufficient knowledge to evaluate them. Furthermore, 49 respondents (29%) stated they were not involved in the studied case but had at least one year of working experience in their field. We assume that their field related to the course topic since other surveys sent out to course participants showed that the involvement in daily work activities related to the course topics was essential for taking the course. The participants' most common occupations relate to management, computer or mathematical, education, training, library, or legal.

<b>Demographic</b>	<b>Descriptive</b>	<b>Percentage</b>
<b>Highest education level</b>	Elementary School	1,8% (3)
	High School	6,4% (11)
	Associate's degree	2,3% (4)
	Bachelor's degree	24,0% (41)
	Master's degree	49,1% (84)
	PhD degree	6,4% (11)
	Missing information	10,0% (17)
<b>Occupation</b>	Not occupied	24,0% (41)
	Occupied	73,1% (125)
	- Management: professional or related occupations	18,1% (31)
	- Computer or mathematical	10,5% (18)
	- Education, training or library	9,4% (16)
	- Legal	7,0% (12)
	- Office or administrative support	5,3% (9)
	- Community and social services	3,5% (6)
	- Other occupation	13,5% (23)
	- Missing information	5,8% (10)
<b>Level of expertise in their field</b>	Less than a year	4,7% (8)
	1–3 years	14,0% (24)
	3–5 years	12,3% (21)
	5–10 years	14,6% (25)
	> 10 years	28,1% (48)
	Missing information	2,3% (4)
<b>Involvement with OGDIs</b>	No involvement at all	40,4% (69)
	Involved to a small extent	19,3% (33)
	Involved	19,3% (33)
	Involved to a large extent	9,4% (16)
	Completely involved	10,0% (17)
	Missing information	1,8% (3)
<b>Trust in the government</b>	No trust in government at all	5,8% (10)
	Trust the government to a small extent	18,1% (31)
	Trust the government	33,3% (57)
	Trust the government to a large extent	31,0% (53)
	Trust the government completely	9,4% (16)
Missing information	2,3% (4)	

*Table 2: Respondents' demographics.*

### 3.3 Measures

Our literature review in Section 2 resulted in a list of 34 OGD I barriers, which we classified into two groups: development barriers and user barriers. The first group concerns obstacles that hinder the development of OGDIs, and the second group concerns obstacles that hinder user-related aspects of OGDIs (see Table 3). In the questionnaire, we asked questions about all 34 individual barriers, as identified in the literature. Respondents had to fill in responses for every barrier question. However, there was an option to select the response ‘I don’t know’ for all inquiries. We tested the questionnaire items with seven persons for understandability, upon which they were made more precise and non-ambiguous. Next, we ran a pre-test involving eight persons. No more changes were made to the questionnaire after the pre-test since the testers did not have any further comments.

Variables	Description
	Scale: 1 – to no extent; 2) to a small extent; 3) moderately; 4) to a large extent; 5) completely
	<b>To which extent did the following development barriers hinder the case?</b>
V1	Risk of releasing privacy-sensitive information
V2	Threat of liability for data quality
V3	Time consumption in gaining permission and access to and reproducing data
V4	Only problems specific to some communities are handled, which de-motivates others
V5	Data is being misused (potentially), which discourages developers
V6	Citizens’ ideas are not taken on board in government administration
V7	The open data initiative tends to be a one-time pilot and lacks sustainability
V8	Risk-averse culture avoids risk from new initiatives
V9	Value-less data published leading to wasted government resources
	<b>To which extent did the following user barriers hinder the case?</b>
V10	Information is available at many different (unknown) places
V11	Heterogeneous terminologies are used
V12	Raw data looks irrelevant to users who are not data specialists
V13	Misinterpretation of the available information results in wrong conclusions
V14	Difficult to use information from combined sources
V15	Chances of contradicting outcomes from data sources
V16	Data is not of sufficient quality to use
V17	Not easy to judge the quality of the information
V18	Biased data lead to unintended or wrong results
V19	Public does not see the benefits of usage at all
V20	Difficult to see returns from investment
V21	Using raw data takes lot of time
V22	Not all groups can use or participate on the platform (digital divide)
V23	Lack of skills excludes some groups
V24	Government might fear a decrease in trust due to transparency
V25	Lack of technical resources to support data publication
V26	Lack of knowledge among users
V27	Lack of expertise of citizens to participate in the open government initiative
V28	Lack of advanced search support
V29	Lack of data analysis support tools
V30	Lack of data visualization and interpretation tools
V31	Lack of interaction mediums on the platform
V32	Lack of helpdesk

<b>V33</b>	No institutional policy for publishing government data
<b>V34</b>	No process for dealing with user input

Table 3: Variables surveyed for OGDIs.

The full questionnaire introduced the study and then asked respondents to describe the OGDIs, including its objectives. We used a mix of open and closed questions to check whether the OGDIs fits our study's scope and such that respondents have a precise framing when answering the questions. Next, closed questions were asked, including the barriers. Finally, we asked for demographic information about the person completing the questionnaire.

## 4. Results

### 4.1 Description of the OGDIs

The examined OGDIs had been implemented in a total of 52 countries. Some OGDIs were not bound to multiple countries. Table 4 depicts the global distribution of the OGDIs. The majority of the OGDIs (24%) are in the Latin American cluster, mainly including initiatives from Brazil and Mexico, and in the Anglo cluster (22,2%), mostly including OGDIs from the U.S.A. Our OGDIs sample includes countries from all country clusters of the GLOBE country classification (see GLOBE Project, 2020). However, it had only a limited number of OGDIs from the Middle East and Confucian Asian country cluster (each 0,6% of the total number of OGDIs) and the Nordic European country cluster (1,2% of the total number of OGDIs). Some OGDIs are related to a country not included in the GLOBE country classification (15,8%) or related to multiple countries concerning multiple country clusters (5,3% of the OGDIs).

<b>Cluster</b>	<b>OGDIs in this cluster</b>
<b>Latin America</b>	24,0% (41)
<b>Anglo</b>	22,2% (38)
<b>Germanic Europe</b>	8,8% (15)
<b>Southern Asia</b>	8,2% (14)
<b>Latin Europe</b>	6,4% (11)
<b>Eastern Europe</b>	4,1% (7)
<b>Sub-Saharan Africa*</b>	2,9% (5)
<b>Nordic Europe</b>	1,2% (2)
<b>Confucian Asia</b>	0,6% (1)
<b>Middle East</b>	0,6% (1)
<b>OGDIs related to countries that are not included in the GLOBE classification</b>	15,8% (27)
<b>OGDIs related to multiple countries that concern multiple country clusters**</b>	5,3% (9)

Table 4: Global distribution of the OGDIs (adopted from (GLOBE Project, 2020; House, Hanges, Javidan, Dorfman, & Gupta, 2004)

Notes:

\*While the GLOBE project states that South Africa is both in the Anglo and the Sub-Saharan Africa cluster, we included South Africa in the Sub-Saharan Africa cluster.

\*\*Some OGDIs relate to multiple countries (e.g. a European project). These OGDIs were not assigned to a cluster.

Most OGDIs in our sample involved a national administrative level (55,6%) or a local executive level (44,4%) (see Table 5). About one-quarter of the OGDIs concerned a regional (25,1%) or state (24%) level OGDIs. Few OGDIs were international, namely 7,6 percent. In the examined OGDIs, it is more common that the public is involved in the operation and maintenance phase (61,4%) than in the implementation, design, or start-up phases. The selected OGDIs involved governments in many roles, mainly operating agencies (70,8%) or implementing agencies (70,2%). The role of developing, regulating, and funding agencies was also relatively common (61,4%, 59,1%, and 57,9%, respectively), while governments were less involved as advertising agencies (28,1%). The stakeholders involved in the investigated OGDIs were diverse. The most represented stakeholders in the investigated OGDIs include policymakers (91,8%), open data portal providers (86%), local governments (84,8%), and national governments (80,7%).

<b>OGDI characteristics</b>	<b>Descriptive of the characteristics</b>	<b>Percentage</b>
<b>Administrative level of the initiative*</b>	Local	44,4% (76)
	Regional	25,1% (43)
	State	24,0% (41)
	National	55,6% (95)
	International	7,6% (13)
	Multiple administrative levels	4,1% (7)
<b>Stage of public involvement*</b>	Start-up	26,3% (45)
	Design	28,1% (48)
	Implementation	45,6% (78)
	Operation and maintenance	61,4% (105)
<b>Role of government*</b>	Operating	70,8% (121)
	Implementing	70,2% (120)
	Developing	61,4% (105)
	Regulating	59,1% (101)
	Funding	57,9% (99)
	Advertising	28,1% (48)
	Another role	8,2% (14)
<b>Stakeholders involved in the initiative (either to a small, medium or large or very large extent) *</b>	Portal providers	86% (147)
	Policymakers	91,8% (157)
	Law enforcers	68,4% (117)
	Infrastructure providers	73,7% (126)
	Local governments (e.g. municipalities)	84,8% (145)
	Regional governments (e.g. provinces)	71,3% (122)
	State governments	75,4 (129)
	National governments	80,7% (138)
	Other stakeholders	42,7% (73)

*Table 5: OGDIs characteristics*

## 4.2 Results from exploratory factor analysis

We conducted an exploratory factor analysis. We used principal axis factoring, as we assume there are underlying theoretical factors that explain the variance in the items. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) equals .862, indicating that sampling is adequate. Bartlett's sphericity is significant at  $p < .001$ , indicating good covariance between our items. All retained items have communalities exceeding .4.

In line with our goal to have an empirically driven categorization of OGD barriers, we rely on eigenfactors to determine the appropriate number of factors. Based on a cut-off value of 1.0, we retain seven factors in our final solution. As we theoretically assume that the categories of barriers may be correlated, we use a non-orthogonal rotation for our factor solution, i.e., Oblimin with Kaiser Normalization. In the final solution, there were no cross-loadings, indicating sufficient discriminant validity. We further find that factor loadings exceed .4, indicating acceptable convergent validity. Table 6 displays the factor weights, including each item set's reliability based on the Cronbach alpha values.

	OGD Use	OGD Use	OGD Use	OGD Use	OGD sharing	OGD sharing	OGD use
<b>Item</b>	Data quality and resources $\alpha = .825$	Functionality and support $\alpha = .878$	Legislation and access $\alpha = .826$	Inclusiveness $\alpha = .791$	Sustainability $\alpha = .779$	Economic, policy and process $\alpha = .679$	Data interpretation $\alpha = .793$
<b>Data is not of sufficient quality to use</b>	.816						
<b>Not easy to judge the quality of the information</b>	.771						
<b>Biased data lead to unintended or wrong results</b>	.584						
<b>Lack of technical resources to support data publication</b>	.448						
<b>Lack of knowledge among users</b>		.434					
<b>Lack of advanced search support</b>		.657					
<b>Lack of data analysis support tools</b>		.867					
<b>Lack of data visualization and interpretation tools</b>		.758					
<b>Lack of interaction mediums on the platform</b>		.612					
<b>Lack of helpdesk</b>		.681					
<b>Privacy</b>			.855				
<b>Liability for data quality</b>			.785				
<b>Time to gain access</b>			.663				
<b>Not all groups can use or participate on the platform (digital divide)</b>				.768			
<b>Lack of skills excludes some groups</b>				.825			
<b>Only problems</b>					.530		

specific to some communities are handled, which demotivates others	
Data is being misused (potentially), which discourages developers	.814
The open data initiative tends to be a one-time pilot and lacks sustainability	.661
Value-less data published leading to wasted government resources	.545
Information is available at many different (unknown) places	.411
Difficult to see returns from investment	.444
Using raw data takes lot of time	.502
No institutional policy for publishing government data	.434
No process for dealing with user input	.413
Raw data looks irrelevant to users who are not data specialists	.529
Misinterpretation of the available information results in wrong conclusions	.542
Difficult to use information from combined sources	.458

*Table 6: Factors relating to OGD I barriers.*

Analyzing 171 survey responses concerning existing OGDIs at various administrative levels worldwide, we found that the most critical categories of barriers concern 1) data quality and resources, 2) functionality and support, 3) legislation and access, 4) inclusiveness, 5) sustainability, 6) economy, policy and process and 7) data interpretation (see Table 6). Out of the seven identified barrier categories, only the sustainability barriers concern OGD sharing. Moreover, only the economy, policy, and process barriers affect both OGD sharing and use. The other five barrier categories merely relate to OGD use, suggesting that barriers at the user side are more obstructive for attaining OGD I objectives than barriers at the data providers' side.

### 4.3. Prioritization of factors

To examine whether some barrier categories were more obstructive in attaining OGD I objectives than others, we computed aggregated scores for each barrier category by calculating the items' average scores in each category. Figure 1 depicts the means of the aggregated barrier categories.

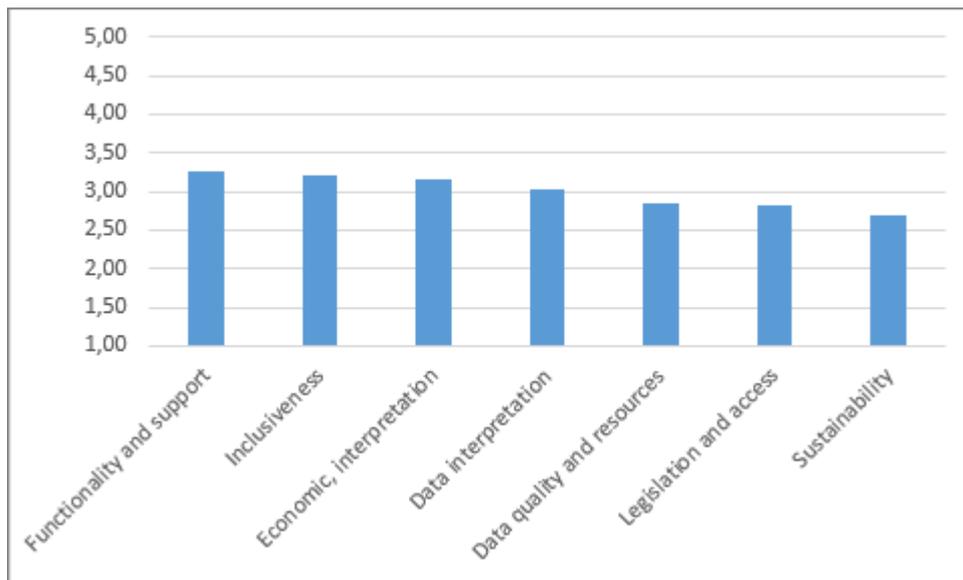


Figure 1: Prioritization of OGD I barriers.

Figure 1 shows that ‘functionality and support barriers’ are the most important. However, the mean does not differ significantly from ‘inclusiveness barriers’ or ‘economic, policy, and process barriers,’ according to the paired t-tests (see Table 7). However, the barrier category of ‘functionality and support barriers’ is significantly more important than the other four categories. This means that, according to our respondents, ‘functionality and support barriers’ are significantly more obstructive in attaining OGD I objectives than barriers in the categories of ‘data interpretation’, ‘data quality and resources’, ‘legislation and access’, and ‘sustainability’. Our findings suggest that the data’s quality, the risk to misuse data, privacy issues, the time consumption of using data, the lack of sustainability of the OGD I initiative, and the fragmentation of the data are less of a concern in the investigated OGD Is. The lack of knowledge among users, the lack of advanced search support, the lack of data analysis support tools, the lack of data visualization and interpretation tools, the lack of interaction media on the platform, and the lack of a helpdesk are more of a concern. These findings suggest that OGD Is should focus on providing sufficient support for open data use through, for example, open data platforms with extensive data analysis, interpretation and visualization tools, interaction media, helpdesks, and training support.

	Functionality and support	Inclusiveness	Economic, interpretation	Data interpretation	Data quality and resources	Legislation and access	Sustainability
<b>Functionality and support</b>							
<b>Inclusiveness</b>	0.494 (n.s.)						
<b>Economic, interpretation</b>	1.381 (n.s.)	0.703 (n.s.)					
<b>Data interpretation</b>	2.347**	1.642 (n.s.)	1.227 (n.s.)				
<b>Data quality and resources</b>	4.883***	3.403***	3.312***	2.114*			
<b>Legislation and access</b>	4.036***	3.011**	2.779**	1.87 (n.s.)	0.304 (n.s.)		
<b>Sustainability</b>	6.318***	4.649***	4.860***	3.539***	1.776 (n.s.)	1.172 (n.s.)	

Table 7: Paired sample t-test results

Notes: degrees of freedom are 168 for all pairs; \*\*\* =  $p < .001$ ; \*\* =  $p < .01$ ; \* =  $p < .05$ ; n.s. = non-significant

‘Inclusiveness’ is the second-most important barrier category and significantly more critical than barriers in the categories ‘sustainability’, ‘legislation and access’, and ‘data quality and resources’. Barriers in the ‘inclusiveness’ category concern: the lack of skills of some groups, the subsequent exclusion of these groups in OGDIs, and the digital divide, meaning that not all groups can use the platform and participate equally. These barriers immediately exclude potential users from the OGDIs, which may explain why they are considered to be more critical than barriers that hinder users’ participation in the OGDIs (e.g., it is not easy to judge the data’s quality) but do not completely exclude them.

The least essential barrier categories are ‘sustainability’, ‘data quality and resources’, and ‘legislation and access’, of which the means are not significantly different from each other. A possible explanation for this might be that many OGDIs were already in the operation and maintenance phase. These OGDIs may already have found a way to sustain themselves. As a result, sustainability issues may not have played a role in these initiatives. Furthermore, if the data involved in our sample of OGDIs would not have been of sufficient quality, and if data protection issues would have played a role, these OGDIs may not have been initiated. In other words, high data quality and a lack of privacy issues may have been preconditions to start the open data initiatives.

## 5. Discussion

### 5.1 Comparing our findings to existing barrier categorizations

Five out of the seven identified barrier categories relate to OGD use, suggesting that barriers at the user side are more obstructive for attaining OGD objectives than obstacles at the data providers’ side. Moreover, the barrier categories that are most obstructive in OGD objective achievement, namely ‘functionality and support’ barriers and ‘inclusiveness’ barriers, are barrier categories related to the use of OGD, in contrast to the sharing of this data. This finding is consistent with previous research. For example, Martin (2014: 232) found that “barriers relating to the demand for and use of OGD are perceived as prevalent.”

The barrier categories identified in this study, ‘data quality and resources’, ‘functionality and support’, ‘legislation and access’, ‘inclusiveness’, and ‘data interpretation’, are different from barrier categories identified in previous research. An open data user barrier categorization used considerably is developed by Zuiderwijk et al. (2012). They identified open data use barriers in ten categories: availability and access, findability, usability, understandability, quality, linking and combining data, comparability and compatibility, metadata, interaction with the data provider, and finally opening and uploading. The only category we found that is explicitly similar to Zuiderwijk et al. (2012)’s categorization concerns ‘data quality’. However, some categories mentioned by Zuiderwijk et al. (2012) also relate to open data interpretation, such as ‘understandability’ and ‘metadata’. Several previous studies identify legislation-related barriers as a category for openly sharing government data (e.g., Barry and Bannister, 2014). In contrast, our research finds that legislation is a more critical barrier category from the perspective of open data use.

One of our identified barrier categories merely relates to OGD sharing, namely ‘sustainability’. Previous research does not identify sustainability as a separate barrier category. For instance, Martin (2014) refers to data and digital technologies, user practices, public management practices, institutions, and resources as OGD sharing and use barrier categories. However, this research did not point expressly at a category of sustainability barriers for OGD sharing and use. Moreover, the barrier category ‘economic, policy, and process’ relates both to OGD sharing and use. Previous research mentions economic barriers as a vital barrier category (e.g., Barry and Bannister, 2014), while policy and process are absent as open data barrier categories in various previous studies (e.g., Barry and Bannister, 2014; Martin, 2014; Janssen et al., 2012).

## 5.2 Implications

Our paired t-tests analyses reveal that functionality and support barriers and inclusiveness barriers are the most obstructive in attaining OGD objectives in our sample of 171 OGDIs (see Table 7). This prioritization of barrier categories has several implications and calls for different actions by practitioners. First, the prioritization of barriers in the ‘functionality and support’ category emphasizes developing advanced tools to support data search, data analysis, data visualization, data interpretation, and open data interaction on open data portals. Developers of open data portals can reduce several OGD barriers by developing functionalities that better support open data use. Several studies already indicated what a more supportive open data platform should look like (for example, Elvira, 2018; Alexopoulos et al., 2014; Marta, 2016). Our findings lend support to the importance of such design studies on OGD platforms.

Second, the barrier category’s importance concerning ‘functionality and support’ implies that user-centered design and helpdesks can support open data users in obtaining the essential organizational support that their use of OGD requires. In the realization of this advice, there is a role for open data portal developers in the design of OGD portals. They need to ensure that open data

portals address portal usability and user experience issues and direct open data users to additional help resources. Furthermore, government agencies that offer data on these portals should be responsive and provide high-quality service. The Information System Success Model hypothesizes that service quality, among several other dimensions, is critical for information systems (DeLone and McLean, 2002; DeLone and McLean, 1992). To enhance service quality, OGD providers need to respond timely to user requests and questions, follow up on user's reports, have adequate knowledge to answer user requests and prioritize the user's needs (Purwanto et al., 2020a).

Third, the prioritization of barriers in the 'inclusiveness' category demonstrates that not all groups can use OGD platforms or participate in the use of OGD. Some societal groups lack the skills to join in OGD use. This finding is consistent with other studies about the so-called digital divide. For example, Wirtz et al. (2018) found that the use of OGD platforms and the data these platforms provide requires citizens to have particular knowledge and skills. Veeckman and van der Graaf (2015) also found that aligning with the specific capacities and skills that citizens possess can make citizen involvement in local OGDIs more inclusive. Additionally, Purwanto et al. (2020b) found that a variety of capabilities and skills of OGD users contributes to the engagement with OGD. The development of training and education programs, both online and offline, can help those currently excluded from OGDIs to develop essential skills for OGD use. Gascó-Hernández et al. (2018) state that open data training programs' success needs to embed the training in specific contexts and particularly needs to consider user interests and expectations.

We derived the implications above from an empirically-informed study, rather than conceptual research, involving a larger group of OGDIs than most of the previous OGDI barrier research has done. Some of the categories we identified are relatively different from existing categories that have been used extensively in the open data literature, such as the 'sustainability' category. The way that previous research identified OGDI barriers did not significantly reduce the impact of OGDI barriers. Our findings suggest several changes in the way that researchers address OGDIs barriers and in the way that policymakers counteract them. For example, barriers such as data fragmentation, the publication of value-less data, not updating published datasets, potential data misuse, and focusing on individual communities' problems while not addressing others' concerns appear to be interrelated and address the sustainability of OGDIs. These factors' interrelatedness suggests they should be clustered. Moreover, their interdependence should be considered when addressing these factors. Finally, another implication of our study is that policymakers should prioritize handling OGD use-related barriers compared to OGD provision-related barriers since the use-related barriers seemed to be more obstructive for attaining OGDI objectives.

## 6. Conclusions

This study aims to categorize and prioritize barriers for openly sharing and using government data based on a large number of existing OGDIs. Our analysis of 171 survey responses concerning existing OGDIs worldwide shows that the most crucial barrier categories concern (in order of most to least crucial): 1) functionality and support, 2) inclusiveness, 3) economy, policy, and process, 4) data interpretation, 5) data quality and resources, 6) legislation and access and 7) sustainability. Out of the seven identified barrier categories, only the sustainability barriers concern OGD sharing. Furthermore, only the economic, time consumption, institutional, and feedback barriers affect both OGD sharing and use. The other five barrier categories merely relate to OGD use, suggesting that obstacles at the user side are more obstructive for attaining OGD objectives than obstacles at the data providers' side.

In the analyzed OGDIs, 'functionality and support barriers' was the most critical category. Barriers in this category were significantly more obstructive to attaining OGD objectives than obstacles in the categories of data interpretation, data quality and resources, legislation and access, and sustainability. Inclusiveness barriers concern the second-most important barrier category, significantly more critical than barriers in the data quality and resources, legislation and access, and sustainability categories. The least essential barrier categories are 'data quality and resources', 'legislation and access', and sustainability.

Our findings show that policymakers should shift their efforts from sharing data to promoting use. Practitioners should focus on the mitigation of the prioritized barrier categories to better support the attainment of OGD objectives. The identified prioritization of open data barriers calls for three primary practitioners' actions to reduce the impact of these barriers: 1) open data portal developers should develop advanced tools to support data search, analysis, visualization, interpretation, and interaction; 2) open data experts and teachers should train potential users, and especially those currently excluded from OGDs due to a lack of digital skills, and; 3) government agencies that provide open data should put user-centered design and the user experience of datasets and portals central to better support open data users. Furthermore, when counteracting OGD barriers, policymakers should consider the interrelatedness between factors within the same category.

Our study concerns a selection of 40 articles for the literature review and 171 OGDs for the survey. Some barriers may have been missing from these articles. Furthermore, we do not claim that the investigated OGDs are representative of all OGDs worldwide. While interpreting our findings, one should keep in mind that respondents from the U.S.A., Brazil, and the Netherlands provided most of the sampled OGDs. However, the selection also includes many other countries. Moreover, other factors not included in our study may affect the barriers we study, such as how long the OGD already exists and the legislation and policies that OGDs need to comply with. The factors that influence OGDs barriers are complex and often interdependent. Future research may also examine the influence of cultural factors on the (lack of) attainment of OGD objectives.

In this study, we rely on our respondents for the assessment of OGDIs. An important assumption is that the collected data reflects the OGDIs rather than the respondents' opinions. About half of the respondents were directly involved in OGDIs, and most of the other respondents had good work experience in their sector. Further, we asked open questions about the OGDIs to check for relevance to our scope. The MOOC had trained all respondents on OGDIs, and we had tested the respondent's level of knowledge on this topic. Therefore, we have confidence in respondents' knowledgeability, although this is always a challenge in this type of survey research.

This study contributes to the open data literature by proposing a new, empirically-driven barrier categorization and prioritization based on a large number of existing OGDIs. The open data barrier categories that we identified through Exploratory Factor Analysis are different from existing categories that have been used extensively in the open data literature. However, some categories are similar (e.g., data quality). We recommend future research on theorizing the impact of OGDIs to take into account our categorization of barriers. Design research studies that develop novel OGDIs should also consider our barrier categorization as a baseline for evaluation.

## References

- Albano CS and Reinhard N. (2014) Open Government Data: Facilitating and Motivating Factors for Coping with Potential Barriers in the Brazilian Context. In: Janssen M, Scholl HJ, Wimmer MA, et al. (eds) *Electronic Government: Proceedings of the 13th IFIP WG 8.5 International Conference, EGOV 2014*. Dublin, Ireland, 181-193.
- Alexopoulos C, Loukis E and Charalabidis Y. (2014) A Platform for Closing the Open Data Feedback Loop based on Web 2.0 Functionality. *eJournal of eDemocracy & Open Government* 6: 62-68.
- Barry E and Bannister F. (2014) Barriers to open data release: A view from the top. *Information Polity* 19: 129-152.
- Beno M, Figl K, Umbrich J, et al. (2017) Perception of Key Barriers in Using and Publishing Open Data. *JeDEM - eJournal of eDemocracy and Open Government* 9: 134-165.
- Berntzen L, El-Gazzar R and Johannessen MR. (2018) Parliamentary Open Big Data: A Case Study of the Norwegian Parliament's Open Data Platform. In: Themistocleous M and Rupino da Cunha P (eds) *15th European, Mediterranean, and Middle Eastern Conference (EMCIS 2018)*. Limassol, Cyprus: Springer International Publishing, 91-105.

- Conradie P and Choenni S. (2014) On the barriers for local government releasing open data. *Government Information Quarterly* 31: S10-S17.
- DeLone WH and McLean ER. (1992) Information systems success: The quest for the dependent variable. *Information Systems Research* 3: 60-95.
- DeLone WH and McLean ER. (2002) Information systems success revisited. *35th Annual Hawaii International Conference on System Sciences*. Hawaii: IEEE, 2966-2976.
- Eckartz S, Hofman W and Van Veenstra A. (2014) A Decision Model for Data Sharing. In: Janssen M, Scholl HJ, Wimmer MA, et al. (eds) *Electronic Government: Proceedings of the 13th IFIP WG 8.5 International Conference, EGOV 2014*. Dublin, Ireland, 253-264.
- Elvira R. (2018) Open spending portal design principles. Enhancing online citizen engagement. *Faculty of Technology, Policy and Management*. Delft, the Netherlands: Delft University of Technology.
- Gascó-Hernández M, Martin EG, Reggi L, et al. (2018) Promoting the use of open government data: Cases of training and engagement. *Government Information Quarterly* 35: 233-242.
- GLOBE Project. (2020) *Global Leadership and Organizational Behavior Effectiveness (GLOBE) 2020*. Available at: <https://globeproject.com/results/clusters/anglo?menu=list#list>.
- House RJ, Hanges PJ, Javidan M, et al. (2004) *Culture, leadership, and organizations: The GLOBE study of 62 societies*, California: Sage publications.
- Janssen M, Charalabidis Y and Zuiderwijk A. (2012) Benefits, adoption barriers and myths of open data and open government. *Information Systems Management* 29: 258–268.
- Ma R and Lam P. (2019) Investigating the barriers faced by stakeholders in open data development: A study on Hong Kong as a “smart city”. *Cities* 92: 36-46.
- Marta RF. (2016) Open government data portal design principles. Implementing transparency, privacy, and information quality by design. *Faculty of Technology, Policy and Management*. Delft, the Netherlands: Delft University of Technology.
- Martin C. (2014) Barriers to the open government data agenda: taking a multi-level perspective. *Policy & Internet* 6: 217-240.
- Martin S, Foulonneau M, Turki S, et al. (2013) Risk Analysis to Overcome Barriers to Open Data.

- Electronic Journal of E-Government* 11: 348-359.
- Myers MD and Newman M. (2007) The qualitative interview in IS research: Examining the craft. *Information and Organization* 17: 2-26.
- Onuoha M. (2017) Machine learning is being used to uncover the mass graves of Mexico's missing. *Quartz*. Retrieved from <https://qz.com/958375/machine-learning-is-being-used-to-uncover-the-mass-graves-of-mexicos-missing/>.
- Parung GA, Hidayanto AN, Sandhyaduhita PI, et al. (2018) Barriers and strategies of open government data adoption using fuzzy AHP-TOPSIS. *Transforming Government: People, Process and Policy* 12: 210-243.
- Purwanto, A, Zuiderwijk A and Janssen M. (2020a) Citizens' Trust in Open Government Data: A quantitative study about the effects of data quality, system quality and service quality. In *The 21st Annual International Conference on Digital Government Research* (pp. 310-318).
- Purwanto A, Zuiderwijk A and Janssen M. (2020b) Citizen engagement with open government data: Lessons learned from Indonesia's presidential election. *Transforming Government: People, Process and Policy* 14: 1-30.
- Saxena S and Muhammad I. (2018) Barriers to use open government data in private sector and NGOs in Pakistan. *Information Discovery and Delivery* 46: 67-75.
- Scholl HJ. (2019) The Digital Government Reference Library. University of Washington.
- Smith G and Sandberg J. (2018) Barriers to innovating with open government data: Exploring experiences across service phases and user types. *Information Polity* 23: 249-265.
- Toots M, McBride K, Kalvet T, et al. (2017) A Framework for Data-Driven Public Service Co-production. *16th International Conference on Electronic Government (EGOV 2017)*. St. Petersburg, Russia: Springer, Cham, 264-275.
- Ubaldi B. (2013) Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives. In: OECD Working Papers on Public Governance N (ed). Paris: OECD.
- USA Facts Institute. (2017) *USAFacts Annual Report 2017. Our nation, in numbers*. Available at: <https://usafacts.org/report-slides>.

- USAFacts.org. (2019) *About us*. Available at: <https://usafacts.org/about>.
- Van Veenstra A and Van den Broek T. (2013) Opening Moves – Drivers, Enablers and Barriers of Open Data in a Semi-public Organization. In: Wimmer MA, Janssen M and Scholl HJ (eds) *Electronic Government: Proceedings of the 12th IFIP WG 8.5 International Conference, EGOV 2013*. Koblenz, Germany, 50-61.
- Veeckman C and van der Graaf S. (2015) The city as Living Laboratory: Empowering citizens with the citadel toolkit. *Technology Innovation Management Review* 5: 6-17.
- Wirtz BW, Piehler R, Thomas M-J, et al. (2016) Resistance of Public Personnel to Open Government: A cognitive theory view of implementation barriers towards open government data. *Public Management Review* 18: 1335-1364.
- Wirtz BW, Weyerer JC and Rösch M. (2018) Citizen and Open Government: An Empirical Analysis of Antecedents of Open Government Data. *International Journal of Public Administration* 41: 308-320.
- Zhenbin Y, Kankanhalli A, Ha S, et al. (2019) What drives public agencies to participate in open government data initiatives? An innovation resource perspective. *Information & Management* 57: 103179.
- Zuiderwijk A, Janssen M, Choenni S, et al. (2012) Socio-technical impediments of open data. *Electronic Journal of eGovernment* 10: 156 - 172.
- Zuiderwijk A, Shinde R and Janssen M. (2018) Investigating the attainment of open government data objectives – Is there a mismatch between objectives and results? *International Review of Administrative Sciences* 85: 645-672. <https://doi.org/10.1177/0020852317739115>