Open data from the brazilian government: understanding the perspectives of data suppliers and developers of applications to the citizens

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Abstract

Open Government Data (OGD) is seen as a way to promote transparency, as well as to provide information to the population by opening data related to various government sectors and processes. By using applications developed with this type of data, citizens gain knowledge about a certain public sphere; governments, in turn, are able to promote transparency and improvements through the interaction with citizens who use such applications. To create these applications, developers need to extract, process and analyze OGD available by data suppliers. This research was conducted in two phases: the first sought to investigate the perspective of developers who use Brazilian OGD; in the second phase, we investigated the perspectives of data suppliers. Through semi-structured interviews with twenty-four developers and data suppliers, this work reports what motivates them to work with OGD, as well as the barriers they face in this process. Our findings indicate that both participants seek to promote transparency for the population, but they run up against poor data quality, cultural barriers, among other issues. We present and qualitatively characterize these issues, providing recommendations for the improvement of the Brazilian OGD ecosystem.

1. Introduction

Open government data (OGD) promotes opportunities for citizen empowerment across the political process, as it creates means for various groups of society to more actively participate in government planning, problem-solving and other activities. Among people involved with OGD, one important role is played by OGD users. Here, they are divided in (i) data suppliers, responsible for making OGD available in open data portals (referred in here as data suppliers) such as dados.gov.br, data.gov; and (ii) the developers, those who extract, manipulate and use this data to develop applications for the citizens.

Albano and Craveiro (2015) such as Harrison, Pardo, and Cook (2012), refers to these both professionals as "intermediaries": individual actors or government representatives and social organizations that work with OGD and provide products or services to governments and society. However, little is known, particularly in Brazil, about how these data suppliers and developers work and what dependencies and barriers they face in the process of providing government transparency for the society. Thereby this paper answers the following research questions:

1.) *What are the motivations of developers and data suppliers to create or collaborate with projects that make use of Brazilian OGD?*
2.) *What are the barriers and challenges that developers and data suppliers face in using Brazilian OGD?*
3.) *What lessons can be learned from the work of developers and Brazilian OGD's suppliers?*

To answer those questions, we conducted 24 semi-structured interviews with 24 data users (12 data suppliers and 12 developers) in a two-phase qualitative study. Our study participants were contacted through mining software repositories hosted on GitHub and by using "snowball sampling" techniques (Cook, 2014). The interviews were analyzed using Grounded Theory techniques (Charmaz, 2006; Glaser & Strauss, 1967).

Our findings indicate that both participants are focused on providing transparency and increasing citizen participation, but they face poor data quality, cultural barriers, and outdated OGD issues, inadequate data formats, and other challenges. In addition, these actors propose improvements based on these motivations and difficulties, then we present and qualitatively

characterize these issues, providing recommendations for the improvement of the Brazilian OGD ecosystem.

The next section presents a brief Background of open government in Brazil. Next, we describe in detail our Materials and Methods used for data collection and analysis. Then we discuss our Results and present a set of recommendations for improving the Brazilian OGD ecosystem as a Discussion. Finally, we close with our Conclusions.

2. Background

The OGD in Brazil begins in 2011 when the country joins the Open Government Partnership (OGP) along with other seven countries (South Africa, the United States of America, the Philippines, Indonesia, Mexico, Norway, the United Kingdom). Together, they signed the Open Government Declaration, aiming at the growth and global incentive of government practices related to government transparency, access to public information and social participation (OGPBrazil, 2014).

In that same year, Brazil issued the Decree of September 15th, 2011, on the National Action Plan on Open Government, with measures that collaborate with transparency and access to public information (Roussef, 2011). In addition to the decree, in November of the same year, the Access to Information Law Nº. 12.527 (AIL) was published to regulate access to information in all the Brazilian government agencies (Matheus, Ribeiro & Vaz, 2015).

In 2016, the Decree Nº.8.777 was signed, which establishes the Open Data Policy of the Federal Executive Branch, under the Ministry of Planning, considered a complement to AIL (Ceasar, 2016). In this decree, questions are established about the free use of the databases, about the request to open this and indicates some data of public interests prioritized for publication. (Roussef, 2016).

To support transparency through e-government, Brazilian government institutions provide official datasets on federal, state and municipal levels (Matheus, Ribeiro & Vaz, 2012). In these portals, various organizations (eg W3C, OKFN-Br, Transparency Hacker Group) and civil society help to create and maintain this, guiding and encouraging discussions and contests such as hackathons (Matheus, Ribeiro & Vaz, 2012).

3. Materials and Methods

An empirical study was carried out with developers (data analysts, programmers, and designers, who used such data to create applications to citizens), this being the first phase. The second phase was the same type of study done with OGD suppliers (programmers, public policy managers, and researchers, all of them associated with some governmental instance and working on the publication of OGD, including the categorization, organization, and availability of such data).

In both phases, we conducted and analyzed a total of 24 semistructured interviews with these OGD users, identified from P1 to P24, of which 12 were developers (first phase) and 12 data suppliers (second phase). Seven of the developers were found by mining software repository (MSR) data hosted on GitHub (GitHub, 2017). We collected historical data of the contributions made to software repositories of three organizations associated with open government projects using Brazilian OGD: The Participation and Innovation Laboratory of the Brazilian Ministry of Justice (LabPi), Open Data Br (dados.gov.br) and Open Knowledge Brazil (OKFN-Br).

For the developers, we selected a total of 334 (three hundred and thirty-four) users who made one or more contributions between February and April 2016 in software repositories owned by those organizations. For each one of them, we extracted information such as name, login, email, and location. Of those 334, 166 had provided an email and declared to be in Brazil (41 of 166). Of these 41 developers, 21 were invited for an interview (the ones with a greater number of contributions to the selected repositories), of which 9 replied accepting the invitation and 7 were interviewed. The other interviewees (5 developers) were contacted based on indications from previously interviewed developers (snowball sampling).

Regarding the data suppliers, all were selected by the "snowball sampling" technique, where the individuals selected to be studied invited new participants from their network of friends and acquaintances, increasing the sample as far as these individuals invited new participants (Cook, 2014). Thus, for the data suppliers, the initial indications came from the first phase participants and for convenience, indicated as being part of the population to be studied. Subsequently, the second phase participants themselves indicated new and old participants as far as they were being interviewed.

3.1. Participants

Tables 1 and 2 summarize demographic information using an identifier "P #" (where "#" consists of a unique number for each participant), the selection method used (snowball sampling or MSR), occupation and location.

3.1.1. Developers - the first phase

Participant ID	Selection method	Occupation	Location (City/State)
P1	MSR	Programmer	Campina Grande/ PB
P2	MSR	Programmer	Brasília/DC
P3	MSR	IT designer	Porto Alegre/RS
P4	MSR	Programmer	São Paulo/SP
P5	MSR	Programmer	São Paulo/SP
P6	Snowball sampling	Programmer	Natal/RN
P7	Snowball sampling	Programmer	Porto Alegre/RS
P8	MSR	Data analyser	Campina Grande/ PB
P9	Snowball sampling	Data analyser	Campina Grande/ PB
P10	Snowball sampling	Programmer	Campina Grande/ PB
P11	Snowball sampling	Data analyser	Campina Grande/ PB
P12	MSR	Programmer	São Paulo/SP

Table 1: Developers' demographics

3.1.2. Data suppliers - the second phase

Participant ID	Indication	Activity	Location (City/State)
P13	Indicated by P12	Programmer	São Paulo/SP
P14	Indicated by P4	Programmer	São Paulo/SP
P15	Indicated by P13	Public policy manager	São Paulo/SP
P16	Indicated by convenience	Researcher	Natal/RN
P17	Indicated by P15	Researcher and programmer	São Paulo/SP
P18	Indicated by convenience	Programmer	Recife/PE
P19	Indicated by P13	Public policy manager	São Paulo/SP
P20	Indicated by P16	Researcher	Recife/PE
P21	Indicated by P18	Programmer	Brasília/DC
P22	Indicated by convenience	Programmer	Natal/RN
P23	Indicated by P19	Programmer	Campina Grande/ PB
P24	Indicated by P21	Researcher	São Paulo/SP

Table 2: Data suppliers' demographics

3.2. Semi-structured interviews

Interviews were conducted individually via Skype, Hangouts or in person, and lasted 35 minutes on average. To developers, we asked demographic questions such as location and work with previous and current software development projects. We also asked them about their background and motivation to use OGD and inquired about their projects and their expectations on the use of such data, as well as their view on both technical and social issues regarding OGD, and challenges and difficulties faced with it. Data suppliers were asked about their expectations regarding the publication (i.e., availability) of OGD, as well as their perspective on technical, social and collaborative issues in their daily work. The interview questions can be found in the first author's master dissertation in Araújo (2017) and by this link: https://goo.gl/VaHV61.

3.3. Data analysis

Grounded Theory (GT) was used emphasizing the Constructivist Method (CM) of Charmaz (2006), which was supported by the Constant Comparative Method (CCM) of Glaser and Strauss (1967). The GT makes use of systematic procedures for collecting and analyzing the data, capable of originating theories through them by codifications (Charmaz, 2006). These codifications occurred by naming segments of data with a concise denomination that categorized, summarized and represented the segment contained in the interviews, performed through the software MAXQDA 12.

4. Results

For each theme that emerged during an interview analysis, were selected transcribed passages that represent the mentioned topic, being derived from the different perspectives of the different actors, exposing the exclusive opinion of them.

4.1. Actors' motivation

Developers		Data Suppliers	
Promote transparency for the society.	*"What motivates me, especially in a country like Brazil, is that we have a lot of corruption problem ... The more we fight for transparency and openness in government, more we'll grow in relation to this. "[P7].*	**Promote transparency (citizen participation).**	*"The first motivation is to help to really open up the government, so that the government's processes are more transparent and, hence, with more control. If we involve people in the production and publication of these data, the chance of being more attuned to what society needs is greater." [P15]*

Provide society with access to a better visualization of the data made available by the government agencies.	*"Improving visualization was one of the motivations. Our team believes that the transparency of data is a way of spreading this and making more people aware of its importance(...) "[P5].*	**To know that users make active use of datasets.**	*"A great motivation is when people speak well of the system. In our case, it was highly praised, even won a prize. So, it makes me want to keep doing what I do. "[P13].*
Promote the translation of available data, improving citizens' understanding.	*"We have the knowledge, so we work as a translator. Not everyone is able to go there to the portal and use that data. The idea is to go after it and give it back to society in a cooler way. "[P9].*	**Promote improvements in public policies.**	*"The data we provide will help in some way to build a more effective public policy. You start asking questions about the data and that brings a lot of questionings and new ways of seeing the city, for example. "[P14]*

Table 3: Developers' motivation X Data suppliers' motivation

Both participants reported, as their main motivation showed in Table 3, the promotion of transparency to society. For developers, this motivation is linked to several situations, such as the current political situation in which the country is passing through [P7]. This same need for political transparency can be identified in the repositories of the LabPi organization. As for the data suppliers, they believe that an Open Government, to be effective, needs to be a transparent government, which generates trust on the part of the citizens, being this transparency is something obligatory in this style of government. They also asserted that, although these open data bear the guardianship of governments, they are owned by the citizens [P15, P18].

In addition, given the difficulty for a common citizen to acquire a know-how about the available data, since these data are offered in the form of spreadsheets with inconsistent information, the respondents reported that they feel the need to provide to society the access to a better visualization of data provided by government agencies [P5]. In contrast, vendors want to know whether users make active use of databases, given that users help build these databases, ensuring positive feedback. According to these participants, this means that the continuity of data use is guaranteed, enabling society to build, together with the government, more effective public policies [P13].

The motivation to enable transparency is due to the developers' need to promote the translation of the data just as they are available and to improve the understanding on the part of the ordinary citizen [P9]. With this, these participants aim to make society aware of what happens in the social context in which it is inserted. Concomitantly, data suppliers are motivated to promote improvements in public policies. To do so, they say they are concerned about

providing easy data to be understood by the users, providing affordable data, usable, and with quality [P14].

All the motivations and objectives arising from the interviews with both actors are encouraged by public organizations, universities, by developers themselves and interested companies. Public and private organizations conduct contests, such as hackathons, distributing prizes for the best applications and publicizing them. Universities make use of laboratories and research groups with open data, promote programming marathons with these data ("*hackfests*"), foment the emergence of ideas and the interaction between students and researchers on the theme [P2, P9, P13].

According to these participants, they themselves promote the exchange of knowledge about the best understanding of how the public machine works, care about the understanding of the citizen, and not only with the extraction of data, but also how to give an understanding of these for the citizens. Finally, companies finance learning in data analysis, along with universities, and train the developers to use and analyze such data [P4].

Figure 2 presents the word-clouds with the motivations of the actors described before. Both were developed using the keywords derived from the analysis process, derived from the codifications made through the GT techniques.

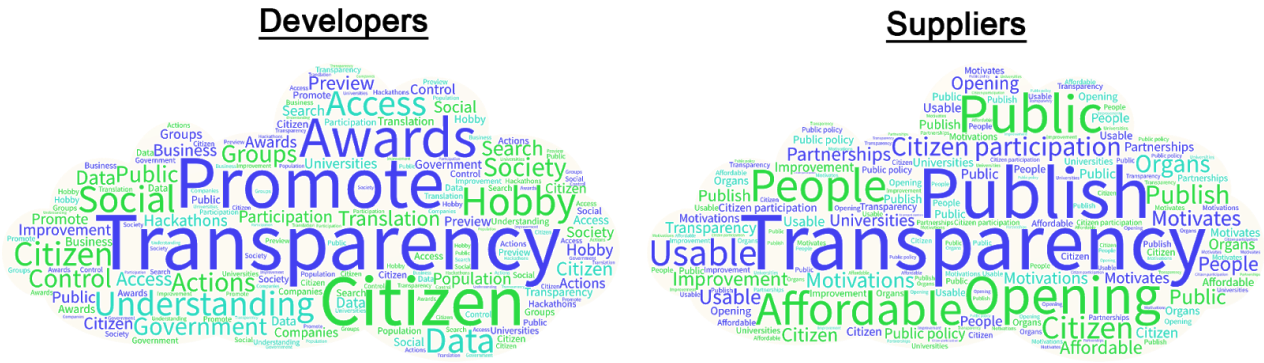

Figure 1: Actors' motivation.

4.2. Challenges faced by the actors

Developers		Data suppliers	
Low quality of available OGD (inconsistency and lack of standardization).	*"Normally it (the quality) is bad, it (the data) are informed in a completely random way (as to its content)". [P7].*	**Lack of culture of openness.**	*"It has the cultural change process on the advantages of openness ... For governments, this is not very obvious, especially when we were talking about corruption, social*

			control, and they are often penalized politically. I believe that many projects are not feasible because of this. This internal part of conviction about the importance of the theme (...) "[P15].
Access difficulty to OGD.	*"It has a lot of difficulty in access(...) including things like forms where they require the person to add the CPF and this is boring, I guess. (...) I think a person could analyze the data in an anonymous way and should not be forced to expose himself to have access..." [P7].*	**The difficulty of access to data by data suppliers.**	*"The data access part is the most exhausting, it's seen as a risk to the project. For example: in the government procurement system, we could not have access to the database (...)" [P21].*
Outdated OGD.	*"My first contact had a lot of headaches because the data I used was very old, had no current data or updates (...)" [P2].*	**Difficulty in improving output quality and data collection.**	*"The main challenge is to improve quality in the production process and data collection to present them to the end user without distortions of reality. That is, according to what is required. "[P22].*
Lack of government support (lack of a sound and uniform policy on data use).	*"I wanted the town hall IT staff to help me more, be more open to the project. In the hackathon project, the difficulty was the documentation of the government's APIs which is very bad (...)" [P6].*	**Difficulty in promoting data integration.**	*"The education secretariat is very large and has a number of subdivisions, and these also have difficulties in getting data from the way it has been organized over time. So it is necessary to consult the subdivision, the servers, the people who use them. It requires time and a lot of work." [P15].*
		Difficulties in categorizing data to be published.	*The organ has a base with a lot of inconsistent information and for this reason, we had to limit the scope enough to categorize. In addition, certain types of data have suffered greater resistance to being released. Quality is also another complicator (...)" [P22].*

Table 4: Challenges faced by developers X Challenges faced by data suppliers.

The low quality of the OGD available is seen, in Table 4, as one of the main barriers to the development process of projects that use them. Among the quality problems of Brazilian OGD, there is the lack of standardization of the data. This term "standardization" was commonly cited by the participants, where it is possible to identify that it is related to how the data are reported in the datasets, presenting inconsistent data, random or with null information [P6, P7]. For developers, the problem of datasets inconsistency, also related to the lack of standardization, is related to the presence of incomplete, illegible or duplicate data in the bases, requiring the

execution of cleanings or filterings that increase the time and the effort for the process development of OGD applications [P3].

For the data suppliers, the main challenge is the cultural barrier. They have argued that high management of the government (servers that lead certain sectors of government, such as secretariats and other departments) still do not have the culture to promote the opening of their data, once it is they who fuel and decide whether the data will be or not be made available. This culture, according to the participants' opinion, has influence on other related challenges, among which are: the difficulty of convincing the government managers in the opening of data, rendering unfeasible the future projects [P15]; the low management of information within public organizations, leading to challenges of a cultural change that shows that the open data are, in fact, public [P19]; legal insecurity on the part of public servants, where some information may in some way compromise certain government sectors, where managers question themselves the content of the information to be opened, occurring interest or disinterest that, in on some occasions, entails in their exposition, because they do not want to run the risk of having their data exposed [P17] and; the fact that the population is not yet in the habit of charging for transparency and opening of government information [P15, P18]. As a consequence of this challenge, the findings point to the commitment of published data quality, including the problem of outdated and inconsistent data [P13].

The difficulty of access the OGD by both actors: According to the citations, it is possible to understand that this barrier violates some OGD principles, such as Opportunity, Accessibility and also those of Antidiscrimination and Non-proprietary. This latter, according to the developers, there was the requirement of user identification and data presented in proprietary formats, respectively. Therefore, this affects in the challenge of poor data quality. For the data suppliers, there are difficulties of access for publication, even with the data being suitable for publication. In this way, it is understood that, although many data are available, not all are considered open as defined by the OGD principles. Therefore, the process of searching, accessing and using this data is compromised by these limitations.

OGD outdated and difficulty in improving the quality of production and collection: Some of the participating developers also reported the problem of outdated OGD, not occurring constant updates and resulting in old datasets. For data suppliers, the data is released for the

purpose of only meeting the LAI goal, without following a social demand or a quality standard that may be required.

Lack of government support (lack of a solid and uniform policy on data usage): Involves the lack of support from government agents, either by providing documentation to aid in extracting and preparing data, as well as by interacting and offering support to developers who use this data in their applications, seeking to meet their demands. For developers, this lack of support is due to the lack of a solid and uniform policy on data usage, with problems of collaboration and feedback between data suppliers and developers, and by the lack of interest of public organizations in improving the quality of the data available, providing information that do not meet the needs of these participants.

On the data suppliers' side, there are difficulties to promote the integration and categorization of the data to be published, those coming from the top management to the portals. This is because the process of disposing of the information in the portals is something that requires time and effort on the part of these data suppliers. In addition, by the lack of quality due to the inconsistency of content and metadata according to the demand from top management, there are also problems with the datasets and metadata, which compromises quality both in the publication work and consequently, for use by the developer. In addition, there are also problems of communication and feedback between the top management and the data suppliers.

Moreover, some reasons that lead to the mentioned difficulties were reported by data suppliers, such as: advances in the policies on the publication of OGD - the need to obtain a data policy that is homogeneous at all levels of government, including at the municipal level; Little interaction between the federal, state and municipal levels - there is little interaction between the open data actions that encompass these spheres; Little labor incentive for application development - which is focused on the work of publishing such data; Lack of IT capacity within public agencies - related to the lack of technical knowledge by specialized servers about certain technologies and also the lack of technical resources within certain government agencies, leading to a deficit of involvement and commitment of IT units within the organs.

Figure 2: Barriers and challenges of the actors.

4.3. Improvements suggested by the actors

Developers		Data Suppliers	
Improvements in the standardization of data for the development process of projects and applications with OGD.	*"One of the things I think could be improved would be a standardization of the data and the format. Because we work with data that is not easy and there is a lot of inconsistency in the data..." [P1].*	**Elaboration of plans that promote the promotion of OGD (creation of events, the collaborative participation of those involved).**	*"(...) It is a slow process of convincement, but when it comes from the top down, it helps. (...) When you have an active society that charges, the sustainability of this is greater. So I think that it's crucial to have that support." [P15].*
Improvements to the current Brazilian policy about OGD (in the face of updates, standardization, and increase in data openness).	*"One of the things I think could be improved would be a standardization of the data, and the format (...) I think politics could regulate this (standardization)." [P1];*	**Improvements in the process of releasing and publishing the OGD (good practices of release and publication, improvements in the management of government information).**	*"We still do not have good manuals to open bases of data. (...) We have manuals but its do not take into account the problems that exist. (...) We still do not have a holdmap on these things. "[P17].*
Improvements related to the support needed for these developers (readability, visualization, and creation of tutorials on OGD understanding).	*"I wanted to have better support in relation to having access to information, information of what they often bring, but often is not what we, as developers, would like to work on..." [P2].*	**Political improvements (standardization of policies and creation of decrees to authorize the further release of OGD).**	*"To have a greater obligation on what needs to be opened or not, a standardization, (...) with different and clearer laws for the federation, state, and municipality, laws that apply to all organs. Basic and minimum laws of data openings, centralization of these tools ... "[P14].*
Improvements to the portals (regarding the access and search of the OGD and tutorials on these portals).	*"It would to promote the information of the data itself, not just make the data available. I think it's kind of thrown in there. "[P10].*	**To look for examples of improvements and countries where the OGD ecosystem is considered ideal.**	*"If you look to England, USA, there are much more advanced portals, portals with lots of information and quality, we can see and realize that there are several*

	applications that have been created and end up creating new services to the citizen and are generating value for the whole ecosystem." [P16].

Table 5: Improvements suggested by developers X Improvements suggested by data suppliers

Table 5 shows that developers have reported problems with inconsistencies and illegibility in this data. Thus, they suggested improvements in the standardization of data for the development process of projects and applications with OGD, such standardization would include the improvement of formats and documentation that are currently available, the presentation of the data in a more descriptive and explanatory way to facilitate visualization and, consequently, their understanding. On the other hand, the data suppliers suggested the elaboration of plans that encourage the valorization of the OGD that, according to them, should mainly reach the top management (government and civil servants that promote the data storage) and gradually follow even to the end users. Some of these plans would be: To promote the creation of events that reach the whole society and to create networks of collaboration between diverse stakeholders and; Promote a collaborative improvement on the data to be published, this can be achieved through the creation of channels or portals for dialogue and discussion, and by the integration of open data infrastructures.

Regarding the improvements to the current Brazilian policy on OGD, the developers reported the need to regulate a constant updating and standardization of this data, so that they present in a simple and readable way, in addition to an increase in the opening of some data or datasets, linked to the difficulty of openness and accessing data that occurs due to political distrust. However, for data suppliers, improvements are needed to directly facilitate the release and publication of OGD, with the promotion of good practices for the release and publication of OGD, which can be gained through the creation of guides, manuals and methodologies that can indicate these practices and, thereby, ensure a better dialogue and feedback between publisher and developer. Another example by data suppliers would be the guarantee of improved access to data, which may facilitate the publication process, as well as assure data suppliers of ownership of the data to be released. In addition, promoting IT capacity and information management within the agencies can also facilitate publication work, being directly linked to the identified

difficulties, guaranteeing more speed of demand and quality on the OGD through its own teams and processes in each sector of the governmental organization.

The participants were also asked about the improvements related to the support they would like to receive in the process of developing projects and applications with OGD. For the developers it would be the guarantee of more readability of the available data, being this related to the necessity of third-party support (from inside the public agencies) that understand the domain of the problem. In addition, it would be the improvement in the visualization of the OGD and creation of tutorials to benefit the explanation of them, guaranteeing the increase of the standardizations and, consequently, the amplitude of the use of these data by the society. For data suppliers, this support is more related to policy improvements that directly collaborate with the OGD release and publication process through the standardization of open data policies - with government programs that foster openness and policies that determine this more clearly - and the creation of decrees that determining the release of data by the high government management.

In addition, developers have suggested improvements to OGD portals with the improvement on the access to data and information about them for interaction with end users, going against the difficulties of access, understanding of OGD and channels of interaction among the actors in the OGD ecosystem. Furthermore, they reported the need for the improvement on the searches for these data in the portals and other means that make them available, besides to the provision of tutorials, manuals or other types of instructions on the portals of OGD, in order to facilitate the process of obtaining and use of this data by the users. At the same time, data suppliers have indicated the search for examples of improvements inspired in countries where the OGD ecosystem is considered ideal, where the concept of transparency and Open Government are effectively exercised (UK, USA, Australia, etc.), influencing most of the improvements identified in the Brazilian OGD ecosystem.

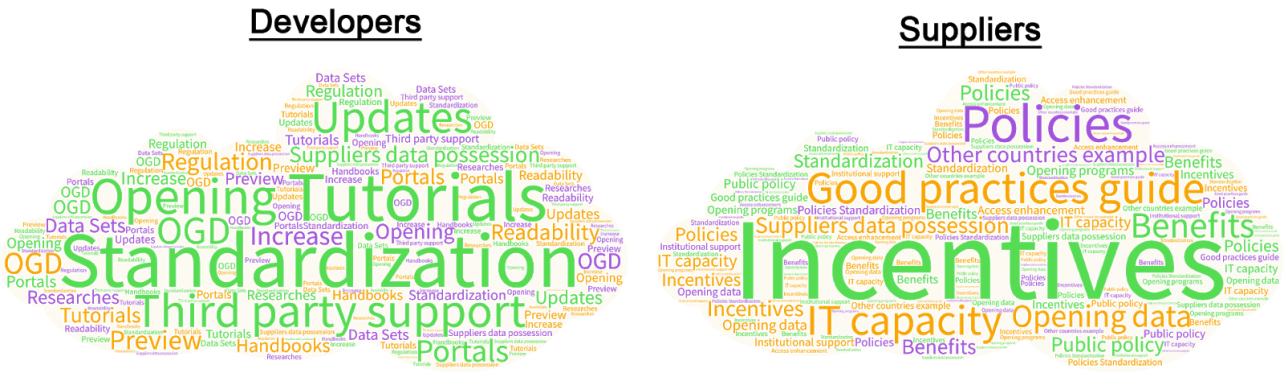

Figure 3: Improvements suggested by the actors.

5. Discussion

Here, we discuss some differences and similarities regarding the actor's perspectives and how its impacts on the Brazilian OGD Ecosystem.

5.1. Differences and similarities as to the motivations of the actors.

In the context of transparency, there is a difference in the objectives it fosters for both actors studied. For developers, this motivation is related to the desire to promote a better understanding of the data (Janssen, Charalabidis & Zuiderwijk, 2012, Hunnius et al., 2015). For data suppliers, the motivation to promote transparency is linked to the issue of provision by publishing such data to society. For Janssen, Charalabidis and Zuiderwijk (2012) this motivation favors democratic accountability and citizenship. However, due to the cultural barrier of top management towards the availability of some OGD, it becomes difficult to promote this social participation (Albano & Reinhard, 2014). Thus, the actors reported having a concern about the accessibility of these data, seeking improvements in public policies in this process.

The differences in the motivations of the actors can be explained by the dependencies between their work in the OGD ecosystem (Araújo, 2017). In the literature, government and data suppliers are seen as a single entity responsible for providing OGD to citizens (Vieira et al., 2009, Germano, 2013, Moreira et al., 2015). However, according to the findings, it is possible to establish a new vision, where governors and data suppliers can be seen the distinct entities in the ecosystem. Figure 4 shows this new view of the Brazilian OGD ecosystem.

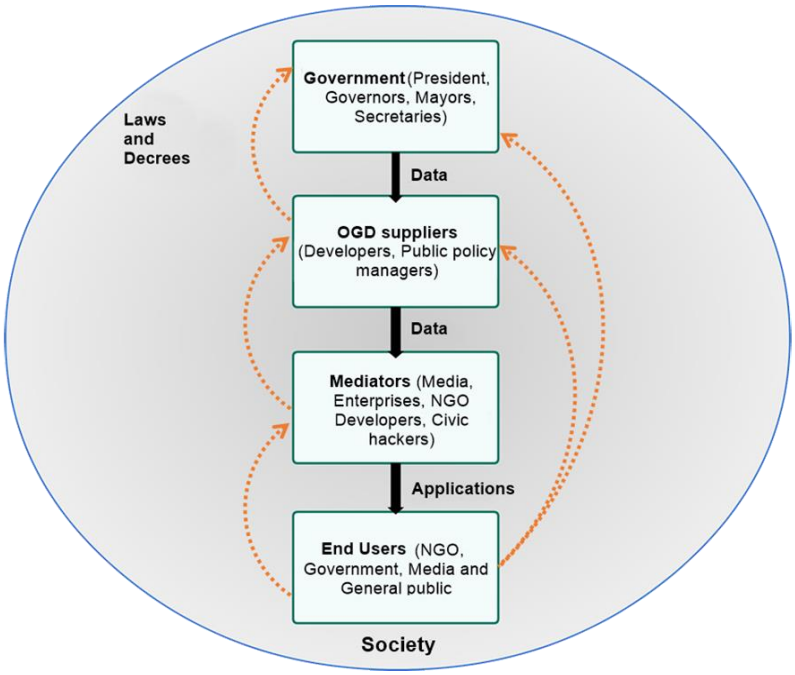

Figure 4: A new view of the OGD ecosystem in Brazil (Araújo, 2017).

Thus, this difference of perspective is related to the role that each one exerts in that environment. Governments are the real holders of the OGD (Broek; Rijken & Oort, 2012). As reported by participants, the government is noted as being responsible for releasing the OGD in which data suppliers publish, developers manipulate and create applications that citizens use (Albano & Craveiro, 2015).

About the encouraging of these motivations, it is possible to identify that data suppliers and developers have the same incentives. Companies interested in OGD and Universities promote, for example, hackathons, where OGD have great potential of inputs for the area of business and entrepreneurship, besides stimulating the sense of community and giving meaning to a service provision space with OGD to the population. (Fontoura, 2015). In addition, these companies provide financial investments to create applications to society (Germano, 2013, Fontoura, 2015) and advisory related to the interaction between government and citizens (Araújo, 2017; Vieira et al., 2009).

5.2. Differences and similarities regarding the challenges faced by the actors.

Concerning the difficulties, Janssen, Charalabidis & Zuiderwijk. (2012) argues that cultural issues are linked to institutional and structural factors of public agencies, affecting all

those involved in the OGD ecosystem. Thus, since data suppliers are closer to the rulers, according to Figure 7, this difficulty becomes more visible from their perspective. As a consequence, it is possible to observe that this cultural barrier, which leads to the difficulty of promoting the opening of the OGD, is linked to questions of openness resistance by the rulers and the lack of IT capacity within the organs that occurs due to the failures of techniques structures in governments, recognizing the need for computational knowledge on the part of those who have these data (Albano & Craveiro, 2015).

The cultural barrier also makes it more difficult to disseminate and update the data, where there is little data adequately disseminated (Albano & Craveiro, 2015). Consequently, this directly affects the work of the developers, where the main difficulty cited was the lack of quality of the OGD. According to Pedroso, Tanaka and Capelli (2013), the low quality compromises the development time of the applications and influences some developers to make deductions about the real meaning of the OGD, affecting the continuity and the quality of the applications (Pedroso, Tanaka & Cappelli, 2013). This quality deficit is also present in the literature (Janssen, Charalabidis & Zuiderwijk, 2012, Germano, 2013, Albano and Reinhard, 2015), meaning that little has been done to mitigate the difficulties arising from this poor quality.

The challenge of defining a uniform policy with advances in the dissemination of these data is an important factor that influences the process of disclosure of OGD (Janssen; Charalabidis & Zuiderwijk, 2012). According to Batista and Gomes (2016), despite the LAI and the Decrees, Brazil complies with the law, but it does not change the administrative culture of which the citizen is part of the government, and he has the right to know the application of public resources and generate a social demand on how these data can be useful (Fontoura, 2015; Albano & Craveiro, 2015).

As for the difficulty in accessing data, for developers, there is a dependence on the type of the open data that the application will consume, since some governments are not mobilized to increase the level of social control over certain data, making it difficult for the public participation in the intervention of its policies. This occurs by cultural issues (Matheus; Ribeiro & Vaz, 2012), as well as to the fact that governments need to designate which data should be published on a given subject, requiring them to define criteria and domain information, which neither always occurs properly (Pedroso, Tanaka & Capelli, 2013). In addition, the lack of infrastructure and technologies, as well as digital exclusion in some regions of the country, end

up hampering access to Brazilian OGD and the optimal functioning of their ecosystem (Batista & Gomes, 2016).

It is noted that government entities are making efforts to overcome such barriers, but progress is slow because of lack of attendance with legislation, failures in the operational and technical structure of governments, and political problems (Albano & Craveiro, 2015). According to Albano and Reinhard (2014), it is noticeable the lack of interest of public officials to cooperate with open data initiatives. It is observed that this resistance occurs since corruption in the country is something that impacts the full functioning of the political system (Lafer, 2017). For Lafer (2017), recent events with corruption scandals in Brazil compromise confidence in institutions and the necessary role of public spirit in a democracy, including the search for a effective transparency. For Albano and Craveiro (2015), the OGD ecosystem is structured by the existed policy and contexts of practices that must be managed and reformed over time to support new cultures of innovation and interaction among the actors.

5.3. Differences and similarities about the improvements reported by the actors

The suggested improvements go against the difficulties identified. For the cultural barrier and, consequently, for the difficulty of opening the OGD and other difficulties arising from it, the data suppliers suggest improvements related to the incentive of the valorization of this data to the rulers, which will also interfere, in a positive way, in the incentive difficulty on the part the end user. Moreover, the improvements that facilitate the process of liberation and publication, for example, interfere directly in the difficulty of support, that promotes the few interactions between government levels and is linked to the openness resistance (Ubaldi, 2013). Besides the difficulty of access, also coming from this same resistance (Araújo, 2017).

For Albano and Reinhard (2014), as seen by these data suppliers too, there is a low interest of government officials in collaborating with open data initiatives. These problems, together with the impasse in obtaining a uniform OGD policy (Martin et al., 2013), have a direct influence on the challenge of providing adequate support for both developers (with problems of collaboration and understanding of OGD), and for data suppliers (with little interaction between government levels and openness resistance from high government management). Therefore, this support difficulty is justified by those actors with communication and feedback problems, due to

the lack of dialogue culture between those who make OGD available and those who use them (Martin et al., 2013).

For Zuiderwijk & Janssen (2014), incentives should be part of the policies that drive these governments and for both actors, including the end user who may not be aware of the potential of the OGD (Zuiderwijk & Janssen, 2014). In addition, clarifying the terms of use of OGD and privacy issues towards legislation can help to improve the current policy by creating incentive forms or mechanisms to further motivate all those involved (Evans & Campos, 2013; Martin et al., 2013; Albano & Craveiro, 2015). Improvements in the difficulty of promoting the opening of OGD can also positively influence the difficulty of their poor quality since the incentives promoted tend to reduce the time of updating and enable the provision of better quality OGD (Albano & Craveiro, 2015). Thus, the suggested improvements to facilitate the application development process will help encourage the provision of standardized OGD and their compliance, driving better support for developers. This means that the suggested improvements to the OGD portals can also be met since it is through them that the developers search for these data (Germano, 2013; Albano & Craveiro, 2015).

Countries such as USA, Canada, UK, and Australia have a more effective Open Government practice (Germano, 2013, Hunnius et al., 2015). Its portals are better established in terms of workflows suitable for capturing, integrating, validating, releasing, updating and promoting reusability (Ubaldi, 2013). In this way, the search for examples of countries where the OGD ecosystem is effective can influence the improvements to the Brazilian OGD portals as well as the political improvements coming from both actors. Thus, for the effectiveness of the ecosystem to occur, it is necessary to have a clear policy regarding the public character of the data, of the information and knowledge generated in governmental action (Agune, Filho & Bolliger, 2010).

5.4. Recommendations to promote incentives and improvements on the process of use of OGD.

In line with the improvements suggested by the participants, the encouragement of the provision and use of OGD should reach out to governments, data suppliers and interested citizens, who must monitor and charge for transparency. Another vision of improvement is focused on OGD policies so that they facilitate and guarantee an effective process of functioning

of their ecosystem. It can be noticed that, even though it found an open data policy in the municipalities and states, only half of them regulated it (Cunha et al., 2015). New ideas that improve the way OGD are used can be geared towards all the other stakeholders and the means that make up the ecosystem, be it portals, developers and the citizen (end user). All the recommendations below are options inspired by and directly linked to the improvements reported by the participants of this research, as shown in the findings, and based on the literature studied. If they are adopted, they can promote better support to those involved in the OGD ecosystem and, consequently, to improve its functioning.

5.4.1. Incentives for the supply and use of OGD

Create and maintain the strengthening of internal departments to governments with teams responsible for the entire process of using OGD: Improvement of IT capacity within the agencies, specializing the sectors to treat the OGD, from the strategic level to the operational level (P15, P17, P21); Increased interoperability and availability of OGD initiatives (Martin et al., 2013).

Invest in skilled labor to improve portals: Increased technical and human resources in direct work to the OGD portals, guaranteeing improvements in its demand and quality (P15, P17, P19, P21).

Promote, improve and disseminate official channels of collaboration, dialogue and feedback among stakeholders, with collaborative networks to set goals on openness and transparency: Progress to the developers support (P5, P8, P10); Encouragement and creation of new channels of communication between interested parties (P15, P16, P20); Improvements in the dissemination of existing groups and channels, encouraging the whole society to take advantage of the potential of OGD (Janssen; Charalabidis & Zuiderwijk, 2012; Matheus; Ribeiro & Vaz, 2015); Elaboration of channels and dialogue portals (P16); Promotion of discussions about openness culture, inside and outside the organizations (P20).

Increase the disclosure through public events on the benefits of OGD in various media: Growth in disclosure investments (Matheus; Ribeiro & Vaz, 2015); Creation of public events (hackathons) (Ubaldi, 2013).

Provide incentives for citizens and developers at portals in municipal and state levels: Increasing the level of incentive and education on OGD in the state portals, being able to balance the municipal and federal levels, since in the states there's greater resistance of incentives in specific portals (Cunha et al., 2015; Albano & Craveiro, 2015).

5.4.2. Improvements in the OGD policies

Updates on the existing Decrees, with clarity and firmness before the declarations on the access, release and update of this data, taking into account the principles of the OGD: Political improvements in the standardization of the OGD with respect to the principles of anti-discrimination, accessibility and processability by machine (Matheus; Ribeiro & Vaz, 2015), (P1, P12); Possibility of remedying deficiencies existing in the Decrees, with clearer laws and serving all government agencies (Evans & Campos, 2013), (P14, P15, P20, P21).

Foster government programs at municipal levels and in less developed regions, with plans to open data to the demands of the population: Enhancement of incentives to improve production and collection of OGD, according to the population demand (P20, P22, P24); Encouraging the creation of regulations aimed at increasing the opening of OGD (Martin et al., 2013), (P8, P9).

Effectively monitor the indices of attendance to these policies and to the rules on OGD, in governments that embrace the elaboration of plans of opening: Habituate citizens to be part of public policies, seeking and monitoring the government actions (Martin et al., 2013, Albano & Craveiro, 2015), (P20, P24).

5.4.3. To the portals

*Emphasize exclusive access areas for developers and ordinary citizens with links to the OGD education, benefits and ways of use:*Increase the knowledge of the population about OGD

through the creation of manuals, methodologies and other instructions (P2, P4, P6, P17, P19, P20, P22);User empowerment and incentives in government decision-making at different levels (Martin et al., 2013).

Keeping up-to-date lists with developed applications: Encouraging the use of applications made with OGD (Cunha et al., 2015); Promote the search by governmental information and in the growth of the control exerted by the society before the governments (P7, P17, P19, P22).

Promote data that can be shared (identified using open W3C standards) and linked with other data, ensuring quality improvement: Benefits in increasing the quality of portals, facilitating their use and searching for OGD (Germano, 2013; Matheus; Ribeiro & Vaz, 2015), (P1, P2, P7, P12).

5.4.4. To developers

Create tools that also help the OGD data suppliers: Growth of partnerships between universities, civil society groups and governments (P9, P13, P24); Encourage the re-use of data by those who organize contests and competitions in the area (Zuiderwijk & Jansen, 2014).

Create tools that also help the OGD data suppliers: Complement on the development of innovations aimed at the publication of OGD, facilitating the work of data suppliers and increasing their access on the data coming from the top management (Matheus; Ribeiro & Vaz, 2015) (P12, P14, P21).

5.4.5. To citizens in general

Acquire the habit of searching for transparency, making use of the portals, encouraging other citizens and actively collaborating with the demand of the information that must be treated: Increasing of the number of OGD and increasing the levels of knowledge about their benefits (Evans & Campos, 2013); (P3, P6, P13, P18, P20); Improvements in public policies by the growth of citizen participation in government decisions (Martin et al., 2013), (P4, P8, P15, P19, P21).

6. Conclusions

This work aimed to identify, firstly, the motivations, challenges, and improvements coming from semi-structured interviews with twenty-four participants, between OGD data suppliers and developers who consume this data. Through GT, the findings point out that these actors, inserted in the OGD ecosystem, have similar motivations to promote transparency and increase citizen presence in government decisions, but with different perspectives, according to their understanding of the data and its openness. The difficulties are directed to low culture by the search for transparency and openness of the OGD, which interfere in a direct way in the process of publication of the data and in the low quality of them. The improvements, in turn, reflect the need to minimize the difficulties presented by the increase of incentives, facilities to open the data and, consequently, to the process of development of applications, improvement of the OGD policies, and improvements in the support needed for the two types of actors and for the portals that have this data.

It is observed, according to previous studies (Araújo, 2017), that little has been done to mitigate the difficulties reported in the interviews, especially those focused on the application development process. As a consequence, this makes it impossible for governments and society to take full advantage of the OGD. Thus, a new set, with new recommendations, has been proposed, inspired and based on the findings and the literature, which can help in valorization and a greater incentive to favor the efficient functioning of the Brazilian OGD ecosystem.

The limitations of this research concern the impossibility of generalizing the findings to all the users of the Brazilian OGD ecosystem. Due to the exploratory nature of this work, the option to use GT generated a saturation during the analysis of the answers on the topics of the first and second phase, and it is not possible to state that all possible perspectives on these issues have been reported between data suppliers and developers using OGD.

Due to the recent character of OGD research in the country (Albano & Reinhard, 2015), there are still many potentials to be reached in social and technological issues in the context of Brazilian OGD. Therefore, it is intended to report new recommendations from these actors, with information related to technical and tooling issues on the work of publishing and developing applications with OGD, in addition to making applications with the identified recommendations, proving their effectiveness.

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