Identification of mechanisms for the increase of transparency in open data portals: an analysis in the Brazilian context

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Abstract

Open Government Data is the data made available free of charge by government entities and can be freely used, reused and redistributed by any person. Open Government Data Portals need to address a number of mechanisms so that society can effectively discover, extract, and utilize the data. The research focus is the identification of mechanisms that can increase transparency in Brazilian Open Government Data Portals. Through the use of scientific literature and the data collection with experts and users, 18 mechanisms have been proposed to increase the degree of transparency in Open Government Data Portals. The results showed that the evolution of the use and research on open data allowed the authenticity, irrefutability, integrity, compliance, breadth, reliability, comprehensibility, citizen participation, referential integrity, and connected data mechanisms to be added to the eight original mechanisms defined by the Open Government Working Group. The classification of these mechanisms and the definition of identifiers made it possible to evaluate the main Brazilian Open Data Portal (dados.gov.br). The criteria and ease of future reapplication will allow comparison with other national portals, serving as a benchmarking to public managers, stakeholders and researchers in the area.

Keywords: Open Government Data. Transparency. Open Government Data Portal.

Identificação de mecanismos para a ampliação da transparência em portais de dados abertos: uma análise no contexto brasileiro

Resumo

Dados abertos governamentais (DAG) são aqueles disponibilizados de modo gratuito por entes governamentais e podem ser livremente utilizados, reutilizados e redistribuídos por qualquer pessoa. Os portais de DAG precisam atender a uma série de mecanismos para que a descoberta, a extração e o aproveitamento dos dados possam ser realizados de forma efetiva pela sociedade. O foco desta pesquisa abrange a identificação dos mecanismos que ampliam a transparência em portais de DAG brasileiros. Por intermédio da literatura científica e da coleta de dados com especialistas e usuários, foram propostos 18 mecanismos que visam a ampliar o grau de transparência em portais de DAG. Os resultados demonstraram que a evolução do uso e das pesquisas sobre dados abertos possibilitaram agregar os mecanismos de autenticidade, irrefutabilidade, integridade, conformidade, amplitude, confiabilidade, compreensibilidade, participação cidadã, integridade referencial e dados conectados aos 8 mecanismos originais definidos pelo Open Government Working Group (OGWG). A classificação desses mecanismos e a definição de identificadores possibilitaram avaliar o principal portal de DAG brasileiro: o <http://dados.gov.br>. Os critérios e a facilidade de reaplicação futura possibilitam a comparação com os demais portais nacionais, servindo como um *benchmarking* para os gestores públicos, as partes interessadas e os pesquisadores da área.

Palavras-chave: Dado aberto governamental. Transparência. Portais de dados abertos governamentais.

Identificación de mecanismos para la ampliación de la transparencia en portales de datos abiertos: un análisis en el contexto brasileño

Resumen

Los datos abiertos gubernamentales son la información disponible de forma gratuita por entidades gubernamentales, que puede ser libremente utilizada, reutilizada y redistribuida por cualquier persona. Los portales de datos abiertos gubernamentales deben seguir una serie de mecanismos para que la sociedad pueda realizar efectivamente el descubrimiento, la extracción y la utilización de los datos. El foco de esta investigación es la identificación de los mecanismos que amplían la transparencia en portales de datos abiertos de gobiernos brasileños. Por intermedio de la literatura científica y de la recopilación de datos con especialistas, se han propuesto 18 mecanismos que buscan ampliar el grado de transparencia en portales de datos abiertos gubernamentales. Los resultados demostraron que la evolución del uso y de investigaciones sobre datos abiertos posibilitaron agregar los mecanismos autenticidad, irrefutabilidad, integridad, conformidad, amplitud, confiabilidad, compresibilidad, participación ciudadana, integridad referencial y datos conectados a los ocho mecanismos originales definidos por el Open Government Working Group. La clasificación de esos mecanismos y la definición de identificadores posibilitaron evaluar el principal portal de datos abiertos del gobierno brasileño (dados.gov.br). Los criterios y facilidad de reaplicación futura permitirán la comparación con otros portales nacionales, sirviendo como una evaluación comparativa para los gestores públicos, las partes interesadas y los investigadores del área.

Palabras clave: Dato abierto gubernamental. Transparencia. Portales de datos abiertos gubernamentales.

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INTRODUCTION

The use of information technology (IT) by public administrations has been an important contributor to social, economic, and political changes, such as administrative reform and increased social scrutiny (YILDIZ, 2007). As a result of this process, new models for relationships between the State and society have emerged, generating opportunities to transform the connection between government and citizens (CUNHA and MIRANDA, 2013).

Several global open government data (OGD) initiatives have emerged in the last decade, with transparency and the reuse of data as the two main objectives (ATTARD, ORLANDI, SCERRI et al., 2015). These initiatives have made a significant amount of public sector information available, free for use and unrestricted redistribution (O'RIAIN, CURRY and HARTH, 2012), with the aim of improving public accountability and citizen participation, as well as collaboration in intersectoral partnerships (LINDERS, 2013). Transparency can be considered the clarification given to the citizen by the State—in reference to what occurs in its sphere of competence—and making public information available quickly and accurately (LOURENÇO, 2015).

OGD is the data which can be freely used, reused, and redistributed by any person (ATTARD, ORLANDI, SCERRI et al., 2015), made available free of charge from governmental entities, and used for civil society projects or integrated with new products, applications or services, such as navigation systems, weather forecasts, or financial and insurance services (UBALDI, 2013).

Lourenço (2015) attributed to OGD the fulfillment of two of the main objectives of open government. The first is to promote transparency through the publication of government data, thus enabling citizens to see what the government does and enhancing accountability of public agents and elected representatives for their actions and decisions. The second objective involves disclosing government data and information that can be reused and provide social or economic value. OGD contributes to social scrutiny, strengthened democracy, active citizenship, improvements in public administration, innovation, cooperation, and transparency (HARRISON, GUERRERO, BURKE et al., 2012).

Nevertheless, in order for these results to be achieved, the data must be in an open, accessible, machine-readable format, and the information generated from them should be produced by everybody and for everybody (HARRISON, GUERRERO, BURKE et al., 2012). The manner in which OGD are made available in Brazilian portals that provide open governmental data (Brazilian portals that disclose OGD – OGDBP) is of fundamental importance. Such portals must meet a number of requirements such that the discovery, extraction, and use of the data can be performed effectively (ATTARD, ORLANDI, SCERRI et al., 2015). To contribute to this aspect, in 2007, the Open Government Working Group (OGWG, 2016) defined eight principles for the free sharing of governmental data (VELJKOVIĆ, BOGDANOVIĆ-DINIĆ and STOIMENOV, 2014). However, these principles do not cover important aspects such as reliability, authenticity, and irrefutability. These aspects are important for ensuring the reliability of the data and the continuity of the reuse of these data by different means, and they are a result of the maturity generated by the use of the OGWG's principles in the last 10 years.

Dawes (2010) highlighted two principles of transparency: usefulness and stewardship. According to these principles, the governmental information made available needs to be appropriate for the purpose and use. Thus, transparency is not the ultimate purpose but rather a means of making available data that attend to a purpose (BALL, 2009). This study analyzed the increase in transparency to attend the purpose of the process of the Accountability Theory (AT) (VANCE, LOWRY and EGGETT, 2015), abstaining from other purposes that can be satisfied by transparency.

According to Vance, Lowry, and Eggett (2015), in the AT, accountability may be a characteristic (virtue) of individuals when demonstrating willingness to accept responsibility for their actions and decisions, or a process of advancing actions and decisions with subsequent accountability. This study adopted the concept of accountability as a process in which individuals have an obligation to explain their actions and decisions to other individuals, who have the right to judge them and to administer positive or negative consequences in response to the actions and decisions taken (VANCE, LOWRY and EGGETT, 2015). When adapted to the focus and theme of this study, the accountability process of the AT is represented by the process of making OGD available in the OGDBP, in relation to the actions, decisions, and public data of public agents and governmental organizations, such that they can subsequently be made accountable (negatively or positively) by citizens, social organizations, and supervisory bodies.

This study considered that an increase in government transparency is an increase in social scrutiny by citizens, because in order to be functional for democratic society and for citizens, transparency needs to enable the monitoring of government initiatives (ATTARD, ORLANDI, SCERRI et al., 2015). From this perspective, the increase in the transparency of portals that provide OGD can be considered an increase in social scrutiny by citizens through data obtained from these portals.

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Considering the above, the criteria for evaluating the transparency in OGDBP can be improved by taking into account aspects such as the opinions of experts and OGD users when defining the degree of importance of the aspects that lead to greater transparency, with the purpose of satisfying the accountability process of the AT. This is the theme of this study, and the question that the research proposes is as follows:

- What are the mechanisms that increase the transparency of Brazilian portals and that make open government data available for the purpose of attend the accountability process of the Accountability Theory?

The mechanisms represent the practical implementation of the high-level definitions, such as transparency and accountability. The term *mechanism* was used analogously to other research areas to identify procedures and groups of transparency indicators in open government data portals. This study adopted the concept of accountability as a process in which individuals have the obligation to explain their actions and decisions to other individuals, who have the right to judge them and administer positive or negative consequences (VANCE, LOWRY and EGGETT, 2015).

The objective of this study was to identify and classify mechanisms that can increase the transparency of OGDBP, in order to attend the accountability process of the AT.

To satisfy the objective, a case study was conducted on the main OGDBP: the Open Data Portal of the Brazilian Federal Government (http://dados.gov.br). The remainder of this study is organized as follows: the theoretical framework is presented first, followed by the research method and then the analysis of the results, in which the characteristics of the studies covered are described, encompassing critical and systematic evaluation; finally, the final considerations and the conclusions of the research are presented.

THEORETICAL FRAMEWORK

Accountability involves objective and subjective responsibility, scrutiny, transparency, mandatory accountability, justifications for the actions that were or have ceased to be undertaken, and rewards and penalties (PINHO and SACRAMENTO, 2009). As a dimension of accountability, the transparency of governmental actions is able to elicit more trust from those being governed toward those governing because transparency is seen as being able to contribute to reducing corruption in the public sphere, and concurrently, it establishes more democratic relations between the State and civil society (PINHO and SACRAMENTO, 2009).

However, according to Raupp and Pinho (2013), accountability may have an even broader perspective, which considers formalized and institutionalized control mechanisms, capable of requiring the accountability of public agents for the acts practiced, and informal mechanisms, such as the scrutiny exerted by the press and by civil society. However, in the latter case, there needs to be an ability to impose sanctions on public agents in the relationships developed from the informal mechanisms. Through this approach, any relationship of control and monitoring on public agents is allowed, using the mechanisms capable of demanding accountability.

For the authors, the execution of accountability requires the responsiveness of the public agents through the ability to report on the acts, and it also depends on the capacity to suffer penalties and loss of power for those who have violated the duties, which depends on the ability to punish (RAUPP and PINHO, 2013).

According to Janssen (2011), open data initiatives can help citizens learn about government activities, improve government accountability, and allow citizens to participate in the political process. Höffner, Martin, and Lehmann (2016) added that open data about government spending has the power to reduce corruption, thus increasing accountability and strengthening democracy, because voters can make decisions by being better informed, and an informed and confident public also strengthens the government itself because the government is consequently more likely to commit to projects.

According to Lerner and Tetlock (1999) and Vance, Lowry, and Eggett (2013), P. E. Tetlock developed the concepts and initial mechanisms of AT in two seminal articles (TETLOCK, 1983a; TETLOCK, 1983b), which then evolved through other articles (TETLOCK, 1985; TETLOCK and KIM, 1987; TETLOCK and BOETTGER, 1989; TETLOCK, SKITKA and BOETTGER, 1989; TETLOCK and BOETTGER, 1994). J. S. Lerner later worked together with P. E. Tetlock on an article (LERNER and TETLOCK, 1999) to develop what is referred to as AT (VANCE, LOWRY and EGGETT, 2015).

According to Vance, Lowry and Eggett (2015), AT explains how the perception of the need to justify behaviors to other individuals produces a sense of accountability for the decision-making process. This perception of accountability, about the

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decision-making process and the outcome, increases the likelihood of a more profound and systematic rationalization of the procedural behaviors themselves.

However, for Akutsu and Pinho (2002), the concept of accountability covers two parts. The first part delegates responsibility such that the second part proceeds to the management of the resources. Simultaneously, it generates the obligation of the resource administrators to account for their management, demonstrating the sound use of these resources.

Campos (1990) mentioned that only from the organization of vigilant citizens who are aware of their rights will there be a condition for accountability, for there will be no such condition as long as the people define themselves as protected and the State as the guardian. Therefore, accountability can only be ensured by the exercise of active citizenship — not by citizens individually but by the organized citizenry (CAMPOS, 1990).

Schillemans, Van Twist and Vanhommerig (2013) argued that accountability is not only beneficial for citizens but also potentially advantageous to the public organizations themselves because by exhibiting accountability for their actions, governmental institutions can demonstrate their legitimacy. According to the authors, accountability is a mirror for public organization—by reflecting on their past actions, the public organizations can learn from their mistakes and successes and therefore improve their performance in the future, which again can increase their support via the citizenry.

For De Kool and Bekkers (2015), the idea of publishing data on the Internet will help to improve not only the quality and performance of a government but also the process of political and public accountability.

The reuse of data maintained by government agencies has great potential: encouraging the generation of skilled services, reducing work overload and redundant procedures, and guaranteeing unrestricted access to citizens (YANNOUKAKOU and ARAKA, 2014). The portals that make OGD available can help to make public these essential components of knowledge, making the data localizable, accessible, reusable, interoperable, and machine-readable, in order to improve the efficiency of the analyses and insights (LINDERS, 2013). Kassen (2013) added that OGD is a concept that involves making government data widely available for anyone, without any copyright restriction.

Accordingly, the main task of public entities is not only to open public data but also to encourage its use and reuse. Thus, the focus is not only on providing new or improved services to citizens but also to make available to society instruments for evaluating the work of the government and to produce substitutive services or services complementary to those provided by public sector bodies (MARAMIERI, 2014).

According to Harrison, Guerrero, Burke et al. (2012), the relationships between information, transparency, and democracy are fundamental and elementary. Information is essential for the development of basic democratic skills, such as the formulation of preferences and opinions, the conjunction of hypotheses, and participation in decision-making. Without these skills, citizens are denied their voice and exercise of their rights. Transparency increases the exposure of government operations to the close scrutiny of the various components of the political system (STAMATI, PAPADOPOULOS and ANAGNOSTOPOULOS, 2015), thus increasing the risk of corruption being detected (ANDERSEN, 2009).

According to Ferranti, Jacinto, Ody et al. (2009), transparency refers to the public and timely availability — with comprehensive and relevant quality — of reliable information about the activities of the government, and it is essential for providing a continuous basis for approval — by the citizenry — of those governing. It covers the voluntary and routine disclose of budget data, audits, policies, and executive actions, and it serves as a source of information for citizens to evaluate the effectiveness of administrative action, increasing the demands on public services provided by the government. Coincidentally, this information also creates pressure to improve performance, due to providing citizens with a continuous return of information and enabling more comprehensive evaluations of government services (HARRISON, GUERRERO, BURKE et al., 2012). Accordingly, Sol (2013) added that transparency helps to hold government officials accountable for their actions and omissions. Thus, as an essential requirement of transparency, the availability of OGD represents the method of making information available to the various segments interested in its content (ATTARD, ORLANDI, SCERRI et al., 2015).

Transparency is considered a precursor of accountability (AL-JAMAL and ABU-SHANAB, 2016), and the latter is closely linked to transparency as an important reducer of corruption levels by making public agents liable (MURILLO, 2015). However, the relationship between the two is not total because, according to Worthy (2015), the accountability associated with transparency — through open data — is still sporadic and unpredictable, driven by particular circumstances, by local issues, and by the combination of random data usage. Thus, lack of data quality is one of the threats to transparency (KOUSSOURIS, LAMPATHAKI,

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KOKKINAKOS et al., 2015), as is the lack of policies that guarantee the continuity of the availability of updated data (SOLAR, DANIELS, LÓPEZ et al., 2014; NUGROHO, ZUIDERWIJK, JANSSEN et al., 2015; LEONTIEVA, KHALILOVA, GAYNULLINA et al., 2015). According to Barry and Bannister (2014), in the United Kingdom, the ultimate objective of accountability through transparency was not attained due to the lack of citizen participation caused by a lack of understanding and trust in the data. However, participation is primarily linked to the appropriate divulgation, through advertising or public notification, such that citizens are aware of the availability of OGD and how such data can be used (KHAYYAT and BANNISTER, 2015). Consequently, it depends on the quality of the data (AL-JAMAL and ABU-SHANAB, 2016; SÁEZ MARTÍN, DE ROSARIO and PÉREZ, 2016; WANG and LO, 2016), the trust in the government, and the understanding of the data provided (WIRTZ, PIEHLER, THOMAS et al., 2016; AL-JAMAL and ABU-SHANAB, 2016). The study of Al-Jamal and Abu-Shanab (2016) indicated that information quality is a determinant of the intention to use government data.

Paradoxically, the improvement in quality can be achieved by the increase in participation and the inherent feedback regarding the publications (ATTARD, ORLANDI, SCERRI et al., 2015). Additionally, it can be obtained by adding services and applications that depend on the data and that consequently generate pressure for higher quality (ZELETI, OJO and CURRY, 2016). Reliability is another important aspect of data quality since it refers to the possibility of verifying and certifying the compliance of the procedures adopted as well as that the data were disclosed accordingly the principles of the government policies and the desired data disclosure characteristics (LOURENÇO, 2015). According to Carter and Bélanger (2005), reliability is one of the significant predictors of the intent of citizens to use an electronic government service. For Pérez, Hernández, and Bolívar (2005), the reliability of financial information can be enhanced if the information is subjected to an audit process that attests to the authenticity and accuracy of the information.

Information can only be obtained from the data when they are related to different contexts or semantic values (PRADO and SOUZA, 2014). Therefore, the use of means that provide comprehensibility related to the OGD is highly relevant (VELJKOVIĆ, BOGDANOVIĆ-DINIĆ and STOIMENOV, 2014; LOURENÇO, 2015). Data transparency involves ensuring that the data are well-known, comprehensible, easily accessible, and open to all (VELJKOVIĆ, BOGDANOVIĆ-DINIĆ and STOIMENOV, 2014) because although data may be available in a machine-readable format, they are not really useful unless they are easy to comprehend (ATTARD, ORLANDI, SCERRI et al., 2015). Thus, a primary concern regarding publicly available data is their comprehension by citizens who do not have specific knowledge in economic or administrative areas, which in turn will affect the ability of these citizens to use the available data (LOURENÇO, 2015).
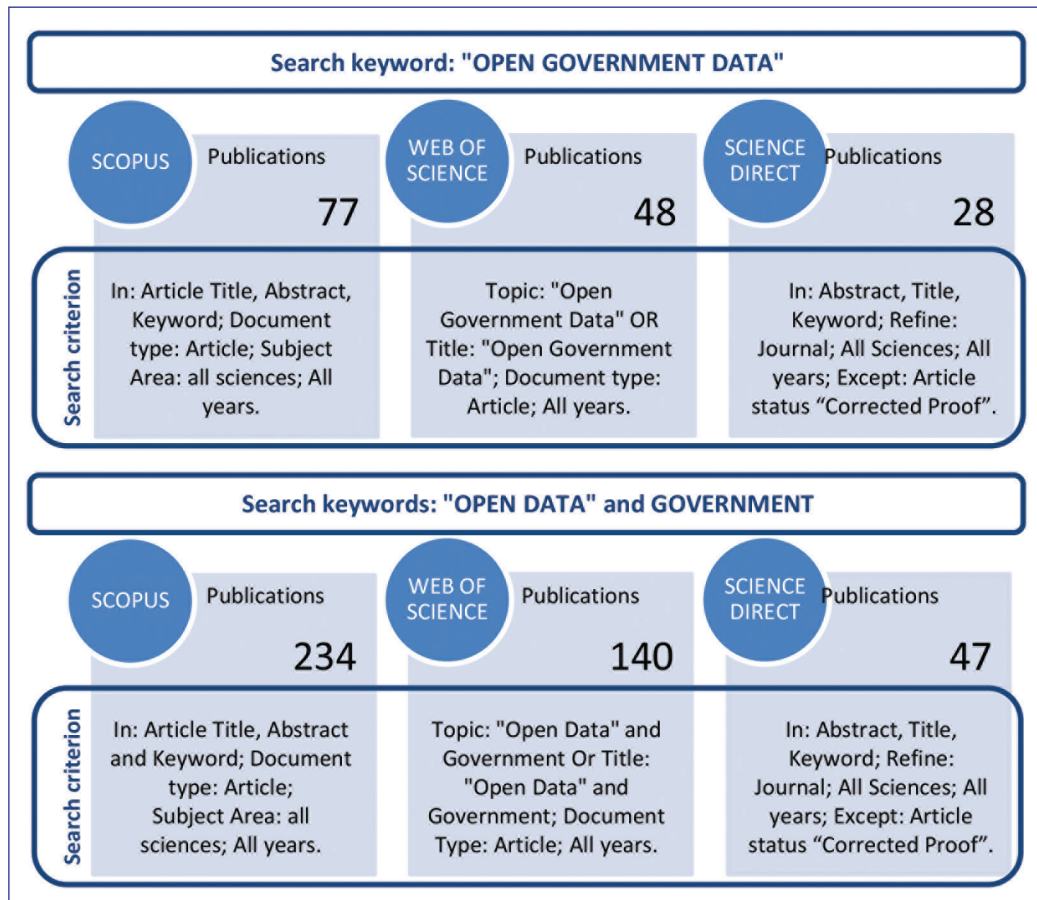
RESEARCH METHOD

This study adopted an exploratory strategy — it aimed to identify the initial concepts about a subject, seeking to discover new possibilities and dimensions of the population of interest (PINSONNEAULT and KRAEMER, 1993). The nature of the research is qualitative, due to the intended result. The research followed particularly the recommendations of Flick (2009) and Gibbs (2009). The study was performed at a specific point in time. As data collection techniques, the systematic literature review (RSL) was used, especially following the recommendations of Cooper, Hedges and Valentine (2009), interviews and discussions with specialists, considering the indications of Gibbs (2009) and the electronic survey with DAG users, as recommended by Malhotra (2012).

The study consisted of five phases: Phase 1 identifies, in the literature, a list of mechanisms that meets the objective of the research; Phase 2 validates with experts and evaluates the mechanisms defined in the previous phase; Phase 3 empirically evaluates the applicability of the mechanisms at the portal <http://dados.gov.br>; Phase 4 evaluates the mechanisms with OGD users and determines the weights of the mechanisms; and Phase 5 calculates the degree of transparency of the portal <http://dados.gov.br>. All phases of the research were conducted between September 2016 and July 2017.

Phase 1 was divided into five stages, which, in an aggregated manner, allowed the identification of mechanisms that can increase transparency in the OGDBP. In the first stage, the bibliographic databases SCOPUS, Web of Science, and ScienceDirect were consulted. The SCOPUS and Web of Science databases were chosen due to their being considered the most important by Wang and Waltman (2016) and because, according to Tober (2011), ScienceDirect provides more results. Figure 1 shows the terms, databases, criteria, and the number of articles arising from the use of these criteria. This first phase was conducted between September and December 2016 and led to the selection of 574 articles, indexed to November 6, 2016.

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Figure 1

Search terms and criteria used

Source: Elaborated by the authors.

In the second stage of Phase 1, repeated articles and articles originating from events and conferences were removed, which left 310 articles.

In the third stage, the articles were verified, based on their content, in order to confirm whether they actually broached the concept of OGD or its use. Articles that did not meet these criteria were removed from the selection. In terms of language, only articles in English and Portuguese were kept. After this phase, 186 articles remained in the selection.

In the fourth stage, the search tool of the *MAXQDA 12* computer program was used, and the terms *transparency*, *transparent*, *transparência*, and *transparente* were searched for in the 186 articles. This stage was performed in order to satisfy the article's objective of identifying mechanisms that could contribute to the increase in transparency through open data. One hundred and forty-five articles were identified using these search terms.

In the fifth stage, the content of the 145 articles was analyzed — obeying the stages of reduction, display, conclusion, and double verification — in isolation (double blind), as defined by Flick (2009). During this analysis stage, 18 mechanisms that could increase the transparency of open data portals were identified.

In Phase 2, the first evaluation of the mechanisms identified in Phase 1 was performed. In the first stage, the 18 mechanisms identified earlier were discussed at the "Roundtable Talk on Open Data" at the 1st Brazilian Open Government Meeting (PARCERIA PARA GOVERNO ABERTO, 2016). The mechanisms presented were praised due to the high degree of evolution in relation to the requirements for OGD.

In the second stage, a survey of the degree of importance of each mechanism was performed via semi-structured interviews with OGD experts administered by the authors. All the individual interviews were performed face-to-face. Seven semi-structured interviews

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were held in São Paulo and in Brasilia between November 30 and December 6, 2016, and were composed of a non-random sampling for convenience, yielding results that are not generalizable (HAIR, BABIN, MONEY et al., 2005) but rather reflect a specific context of the main OGDBP (<http://dados.gov.br>). All the respondents were recommended as references of renowned knowledge—at the national level—regarding OGD and have strategic positions in the following organizations: W3C Brazil, Cetic.BR, NIC.BR, the Ministry of Transparency or the Ministry of Planning. Five respondents had already used the data in scientific research and audits. All respondents were directly or indirectly involved in defining data publication strategies at the portal <http://dados.gov.br>. As a collection instrument for the interviews, an individual kit was prepared for each interviewee, consisting of one A3-sized sheet, five A4-sized sheets, and 18 post-it notes, each containing one of the 18 mechanisms and their indicators. When beginning the interviews, the A3-sized sheet was presented—it contained the 18 items pasted on post-it notes, always in the same order. Also presented were five A4-sized sheets, which related to the different degrees of importance, varying from Extremely Important to Unimportant.

The objective of the interview and the procedure were explained at the beginning of the interview. Subsequently, each respondent was asked to place each post-it note on one of the A4-sized sheets in regard to their perception of the degree of importance of the mechanism. The collection process enabled several reclassifications of the degree of importance through the rearrangement of the post-it notes on another A4-sized sheet. During this classification process, the respondent's comments were collected regarding the motive for each degree of importance provided and the indicators of these mechanisms on the portals. At the end, the respondents were asked to indicate other items they consider to be important. On average, the interviews lasted 32 minutes. Figure 2 illustrates the collection process, which was operated by the respondents themselves.

Figure 2

Support instrument for the interviews with experts
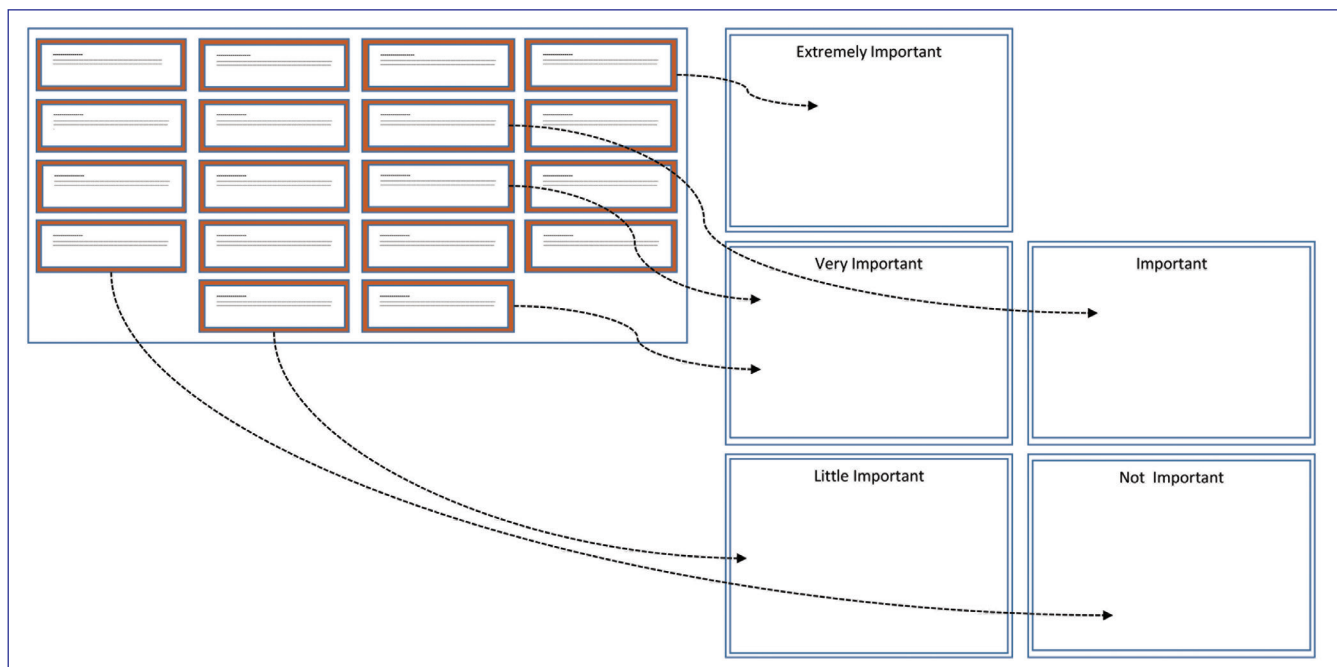
Source: Elaborated by the authors.

In Phase 3, the content analysis of the Open Data Portal of the Brazilian Federal Government (<http://dados.gov.br>) was performed between January 5 and 11, 2017, with the aim of identifying the applicability of the mechanisms in a national empirical context. The categories of information analyzed in this phase were based on the basic dataset indicator (BDS) of Veljković, Bogdanović-Dinić, and Stoimenov (2014), which determines the presence of the most common predefined open data categories: Finance and Economy, Environment, Health, Energy, Education, Transport, Infrastructure, Employment, and Population.

In Phase 4, a collection of data was performed with the OGD users through an electronic instrument sent via e-mail, which contained the 18 mechanisms and their indicators, already adapted to the improvements indicated by the experts in Phase 2.

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The electronic instrument had already passed the face-to-face and content validation, which was performed by nine researchers from the Administration area—four of them were doctors with research related to OGD. Subsequently, the instrument underwent a pre-test.

The electronic collection with the open data users occurred between June 6 and July 15, 2017. The respondents were part of a non-random sampling for convenience. The results were not generalizable (HAIR, BABIN, MONEY et al., 2005), but they reflected the usage context of the OGD. The sample used included respondents from 95 Brazilian citizen observatories, 10 respondents from Brazilian social activism entities (Abraji, Artigo19, Data Pedia, Gastos Abertos, LinKn, Operação Serenata de Amor, PoliGnu, Radar Parlamentar, and Transparência Brasil), and 10 users who are members of the Dados Abertos (Open Data) group on Facebook. The reliability of the instrument was measured using Cronbach's alpha coefficient. The *SPSS 20.0* software was used for the analyses. A Cronbach alpha of 0.677 was obtained for the group of 18 mandatory variables, considering the 115 valid responders. According to Hair, Anderson, Tatham et al. (2009), Cronbach alpha values greater than 0.6 are acceptable in exploratory studies when defining new research instruments, as is the case in this study.

ANALYSIS OF THE RESULTS

Among the results from the content analysis of the articles, six articles were identified as presenting methodologies for evaluating OGD transparency, which were noteworthy due to them having clear criteria for OGD. The article by Attard, Orlandi, Scerri et al. (2015) covers the largest number of requirements for OGD in relation to the increase in transparency. The requirements of these methodologies — regarding transparency — are summarized in Box 1.

Box 1

Articles with methodologies for evaluating OGD transparency

Authors / Criteria (alphabetical order)	[Solar]	[Veljković]	[Attard]	[Lourenço]	[Murillo]	[Vetrò]
Accessible	X	X	X	X	X	
Authenticity				X		
Citizen participation / Citizen collaboration	X	X	X			
Complete		X	X	X		X
Comprehensibility		X	X	X		X
Connected		X	X		X	
Identification of data for accountability			X	X		
License-free	X	X	X	X		
Machine processable		X	X		X	X
Non-discriminatory		X	X			
Non-proprietary		X	X	X		X
Number of the edition/Versioning			X			X
Periodicity		X		X		
Primary	X	X	X	X	X	
Referential integrity/consistency	X		X	X		X
Reliability	X	X	X	X		X
Timely		X	X	X	X	X
Legend/Reference:						
[Solar]: Solar, Daniels, López et al. (2014)						
[Veljković]: Veljković, Bogdanović-Dinić, and Stoimenov (2014)						
[Attard]: Attard, Orlandi, Scerri et al. (2015)						
[Lourenço]: Lourenço (2015)						
[Murillo]: Murillo (2015)						
[Vetrò]: Vetrò, Canova, Torchiano et al. (2016)						

Source: Elaborated by the authors.

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Policy was a recurring theme in the articles analyzed in the systematic literature review (present in 146 articles), which emphasized policy for the generation of incentive legislation and continuity of OGD publications. In the sixth stage, it was considered appropriate to perform content analysis of the national legislation regarding the publication of governmental data intended for citizens. The legal requirements destined to increase transparency in government publications are detailed in Box 2.

Box 2

Requirements for the publication of governmental data, in accordance with the legislation

Mechanisms/Requirements (alphabetical order) / Laws or decrees (alphabetical order)	Complementary law 131/2009	Decree 7.185/2010	Law 12.527/2011	Decree 7.724/2012	Decree 8.777/2016
Accessible	X	X	X	X	X
Amplitude		X	X		
Authenticity			X	X	
Citizen participation	X		X		X
Complete	X				X
Comprehensibility			X	X	X
Divulgation			X		
Identification of data for accountability					X
Integrity		X	X	X	X
License-free					X
Machine processable			X	X	X
Non-proprietary			X	X	X
Periodicity			X	X	X
Primary			X	X	X
Reliability		X			
Timely	X	X	X		X

Source: Elaborated by the authors.

The legislation analyzed considered the laws and the decrees used in the research of the Institute of Socio-Economic Studies (INESC) regarding governmental transparency (INESC, 2014), the Brazil Transparent Scale (CGU, 2016), and the National Ranking of Transparency (MPF, 2016).

The mechanisms are part of the practical functioning of the high-level definitions, such as transparency and accountability. Drawing a parallel with the research in information technology governance (ITG), ITG mechanisms can be understood as being procedures, artifacts, or a set of actions that must always be associated with one or more of the objectives of the ITG (VAN GREMBERGEN, DE HAES and GULDENTOPS, 2004). In the case of transparency in OGDBP, the mechanisms are reapplied as procedures, artifacts, or a set of actions that aim for transparency by respecting principles.

The principles, issues, criteria, and requirements related to the increase in OGDBP transparency — with the purpose of satisfying the accountability process of the AT (VANCE, LOWRY and EGGETT, 2015) — are addressed as mechanisms in the course of this study, when defining methods of implementing them by means of indicators that show them in OGDBP.

The 18 mechanisms that can increase transparency in open data portals were identified during Phase 1 of the study — especially in the fifth stage — and are described in Box 3.

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Box 3

**Mechanisms for increasing the transparency in Brazilian portals that make available
open government data, in accordance with the systematic literature review**

Accessible: Made available to reach the largest number of people possible and for the largest possible number of purposes. Example: available 24 hours a day, 7 days a week with a unique link for use by software applications.
Amplitude: Availability of all the data required by the Brazilian legislation.
Authenticity: Use of errata, edition number of the dataset, and Hash/Checksum of the data.
Citizen participation in quality evaluation: Use of feedback mechanisms and allocation of quality to the data. Examples: Links to ombudsman and answering complaints about the data.
Complete: Availability of all public data, beyond what is required by the law.
Comprehensibility: Ease of understanding, through the use of glossaries, booklets, examples of use, multimedia resources, tutorials, games, and entertaining stories, explaining the terms and concepts related to the published data.
Connected: Use of ontologies or resource description framework (RDF) formats.
Divulgation: Publication on social networks and government sites regarding new data made available. Example: Promotion of hackathons with the available data.
Irrefutability: Identification of the person responsible for the publication and electronic signature of the data, by the person responsible.
License-free: Public data must not be subject to copyrights, patents, trademarks, etc.
Machine processable: In structured format to allow automated processing, with tabular and standardized records, with documentation on the data format and the meanings of the items available.
Non-discriminatory: Available to any person, without the need for registration or any other procedure preventing access.
Non-proprietary: The data must be made available in non-proprietary data formats. Example: ODS instead of XLS.
Periodicity: Identification of the date of publication and the frequency for updating the data. Respect for the frequency defined and compliance with the periodicity stipulated in the legislation.
Primary: Presented as obtained at the source, with the highest possible level of granularity, without summarization, aggregation, or modification.
Referential integrity: Identifiers of coherent data among the various data sources in the same portal. Example: Code of the municipality of the IBGE for the identification of municipalities in all the municipality datasets.
Reliability: Identification of which data were subjected to an audit process (TCU, TCE, etc.) and which were not.
Timely: Made available as quickly as necessary for the preservation of their value. Example: Expenses and receipts from the last financial year.

Source: Elaborated by the authors.

Figures 3 and 4 show the groups of mechanisms with different numbers of indicators. The mechanisms with one indicator are in Figure 3.

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Figure 3

Indicator of mechanisms

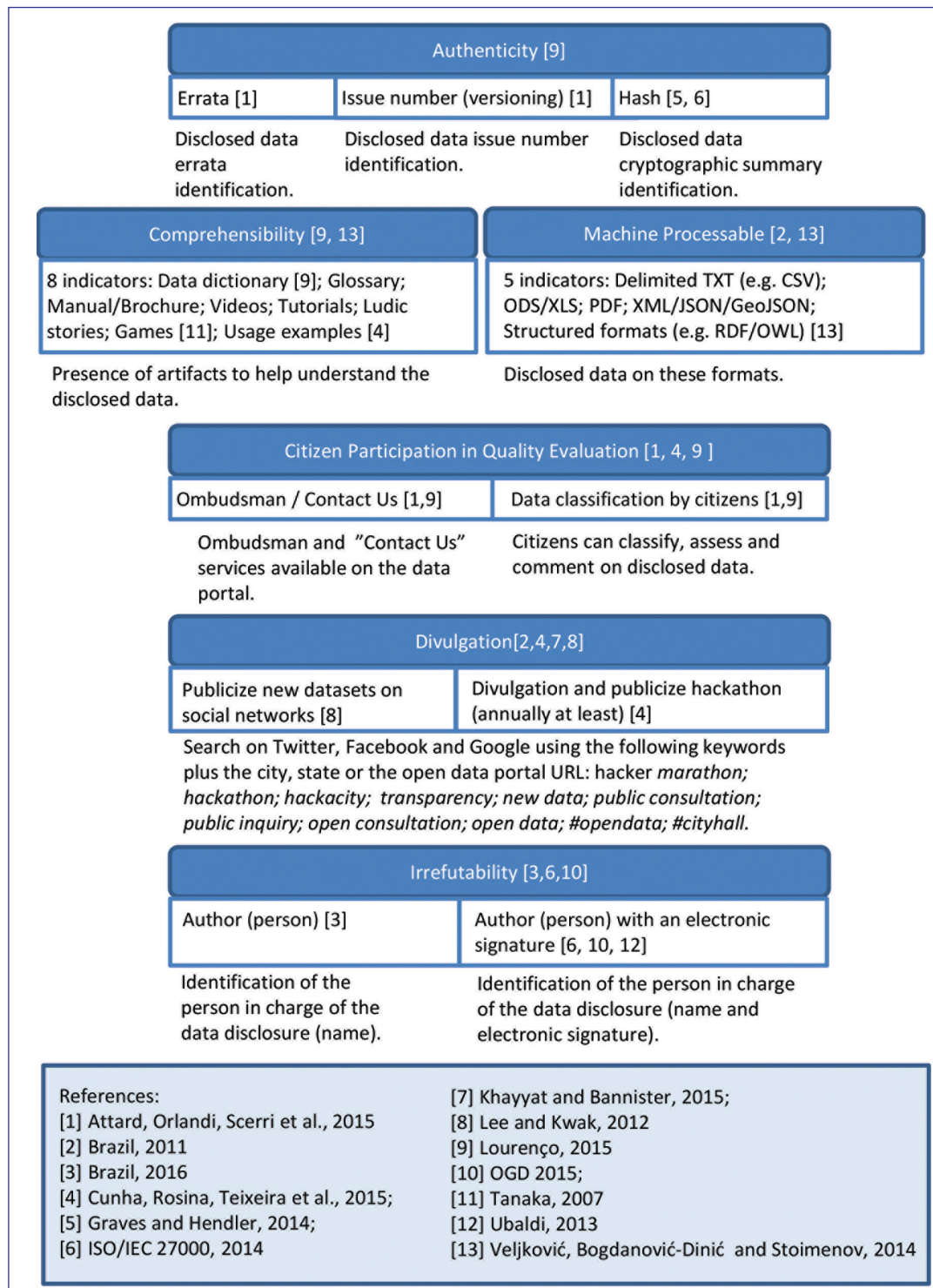|		
Accessible [9]	**Amplitude [3,6]**	**Complete [1]**
Existence of access link to the data without the occurrence of access error and without the need for registration or authentication of the user to access the data.	Disclosure of all data demanded by the Brazilian legislation (compliance with legislation).	Disclosure of all public data including those not demanded by law.
Connected [1]	**Licenses-free[5,9]**	**Non-Discriminatory [9]**
Use of ontologies or RDF formats.	Disclosed data through open licenses software.	Non-registered user to access the data set.
Non-Proprietary [4,9]	**Periodicity [5,7]**	**Primary [1,9]**
Non-proprietary data formats.	Data date and periodicity disclosure and periodicity compliance.	Non-grouped and non-totalized data.
Referential Integrity[1]	**Reliability [8]**	**Timely [2,9]**
The same data identifiers in all disclosed data sets.	Identification of which data were submitted to auditing (such as federal or state Courts of Audits).	Last two fiscal years data.

References:
[1] Attard, Orlandi, Scerri et al. (2015)   [5] Brazil (2016)
[2] Brazil (2000)   [6] INESC (2014)
[3] Brazil (2010)   [7] Lourenço (2015)
[4] Brazil (2011)   [8] Pérez, Hernández and Bolívar (2005)
                                                [9] Veljković, Bogdanović-Dinić and Stoimenov (2014)

Source: Elaborated by the authors.

Among the 18 mechanisms, "Citizen participation in quality evaluation" and "Divulgation" have, in total, four indicators that evaluate the portal. The other 16 mechanisms have 32 indicators that analyze each dataset. Thus, in each dataset available in a portal, 32 verifications of indications of mechanisms are performed.

The mechanisms with multiple indicators are identified in Figure 4.

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Figure 4

Indication of mechanisms with multiple indicators

Authenticity [9]		
Errata [1]	Issue number (versioning) [1]	Hash [5, 6]
Disclosed data errata identification.	Disclosed data issue number identification.	Disclosed data cryptographic summary identification.

Comprehensibility [9, 13]	Machine Processable [2, 13]
8 indicators: Data dictionary [9]; Glossary; Manual/Brochure; Videos; Tutorials; Ludic stories; Games [11]; Usage examples [4]	5 indicators: Delimited TXT (e.g. CSV); ODS/XLS; PDF; XML/JSON/GeoJSON; Structured formats (e.g. RDF/OWL) [13]
Presence of artifacts to help understand the disclosed data.	Disclosed data on these formats.

Citizen Participation in Quality Evaluation [1, 4, 9]	
Ombudsman / Contact Us [1,9]	Data classification by citizens [1,9]
Ombudsman and "Contact Us" services available on the data portal.	Citizens can classify, assess and comment on disclosed data.

Divulgation[2,4,7,8]	
Publicize new datasets on social networks [8]	Divulgation and publicize hackathon (annually at least) [4]

Search on Twitter, Facebook and Google using the following keywords plus the city, state or the open data portal URL: hacker *marathon*; *hackathon; hackacity; transparency; new data; public consultation; public inquiry; open consultation; open data; #opendata; #cityhall.*

Irrefutability [3,6,10]	
Author (person) [3]	Author (person) with an electronic signature [6, 10, 12]
Identification of the person in charge of the data disclosure (name).	Identification of the person in charge of the data disclosure (name and electronic signature).

References:
[1] Attard, Orlandi, Scerri et al., 2015
[2] Brazil, 2011
[3] Brazil, 2016
[4] Cunha, Rosina, Teixeira et al., 2015;
[5] Graves and Hendler, 2014;
[6] ISO/IEC 27000, 2014

[7] Khayyat and Bannister, 2015;
[8] Lee and Kwak, 2012
[9] Lourenço, 2015
[10] OGD 2015;
[11] Tanaka, 2007
[12] Ubaldi, 2013
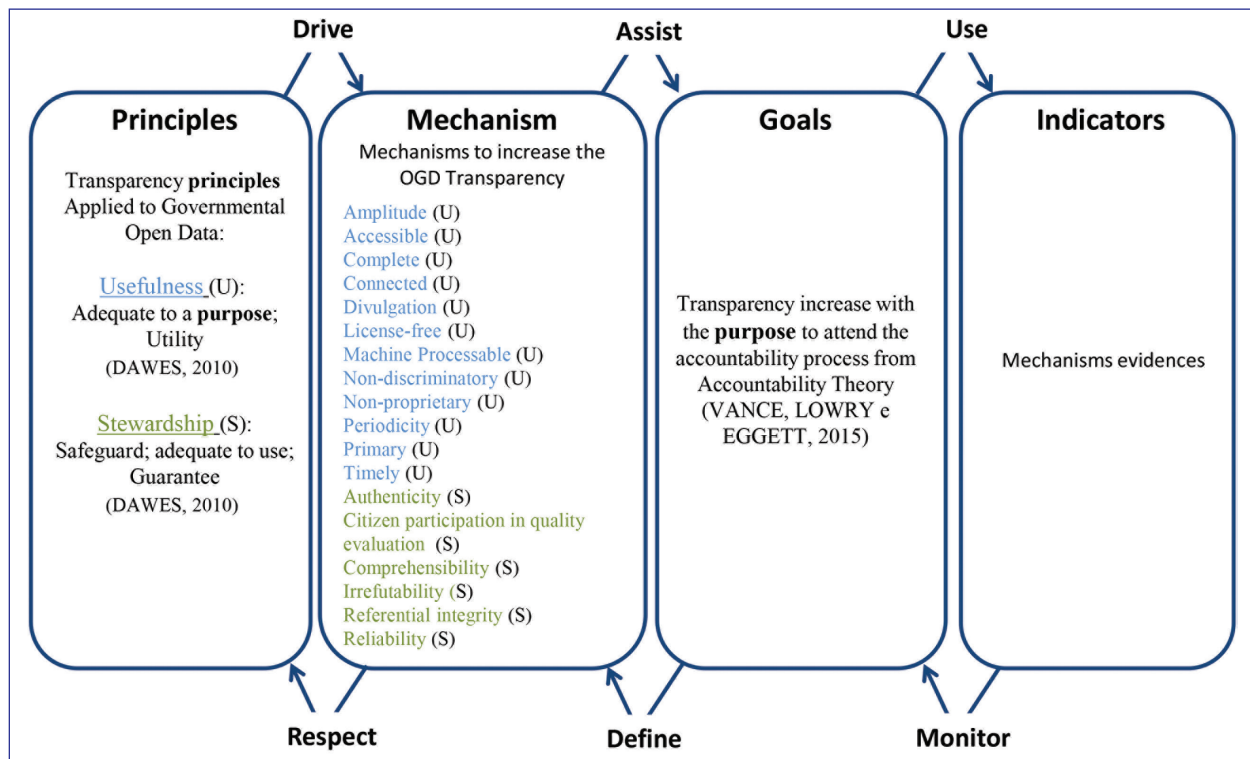[13] Veljković, Bogdanović-Dinić and Stoimenov, 2014

Source: Elaborated by the authors.

From the mechanisms identified in Phase 1 of the study, a conceptual model was defined with the relationships between the elements addressed in this study (Figure 5).

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Figure 5

Conceptual model

Source: Elaborated by the authors.

As presented, the principles direct mechanisms that meet the goals and that are monitored by indicators. Through the mechanisms marked "(U)", it is suggested that OGD becomes appropriate for the purpose of attend the accountability process of AT. Similarly, by means of the mechanisms with the indication "(S)", it is suggested that OGD is more suited to this use, since they are authentic, reliable, comprehensible, whole, and irrefutable and have evaluated quality. Deference to the principles of transparency — referred to as usefulness and stewardship — allows governmental data to be appropriate for a purpose and a use (DAWES, 2010). Thus, transparency is not the ultimate purpose but rather a means to achieve some purpose (BALL, 2009).

In this study, the purpose of the transparency was to attend the accountability process defined in the AT (VANCE, LOWRY and EGGETT, 2015). In this process, individuals have an obligation to explain their actions and decisions to other individuals, who have the right to judge and administer positive or negative consequences (VANCE, LOWRY and EGGETT, 2015). However, the objective of this research was not to measure the effectiveness of the accountability through OGD but rather to identify and evaluate the mechanisms for increasing transparency for this purpose, through the perception of experts and OGD users.

Thus, when adapted to the focus and theme of this study, the accountability process of the AT became the process for making OGD available in portals, in relation to the actions, decisions, and public data of public agents and governmental organizations, for them to be subsequently made accountable (negatively or positively) by citizens, social organizations, and supervisory bodies.

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Expert evaluation of the mechanisms for increasing transparency

The result of the classification by degree of importance — obtained through the interview with experts — is shown in Graph 1. In this graph, the mechanisms are arranged in descending order of weight, and the values of each bar show the total number of respondents who attributed a level of importance to the mechanism.

Graph 1

Evaluation of importance, in accordance with the results of the interviews with experts
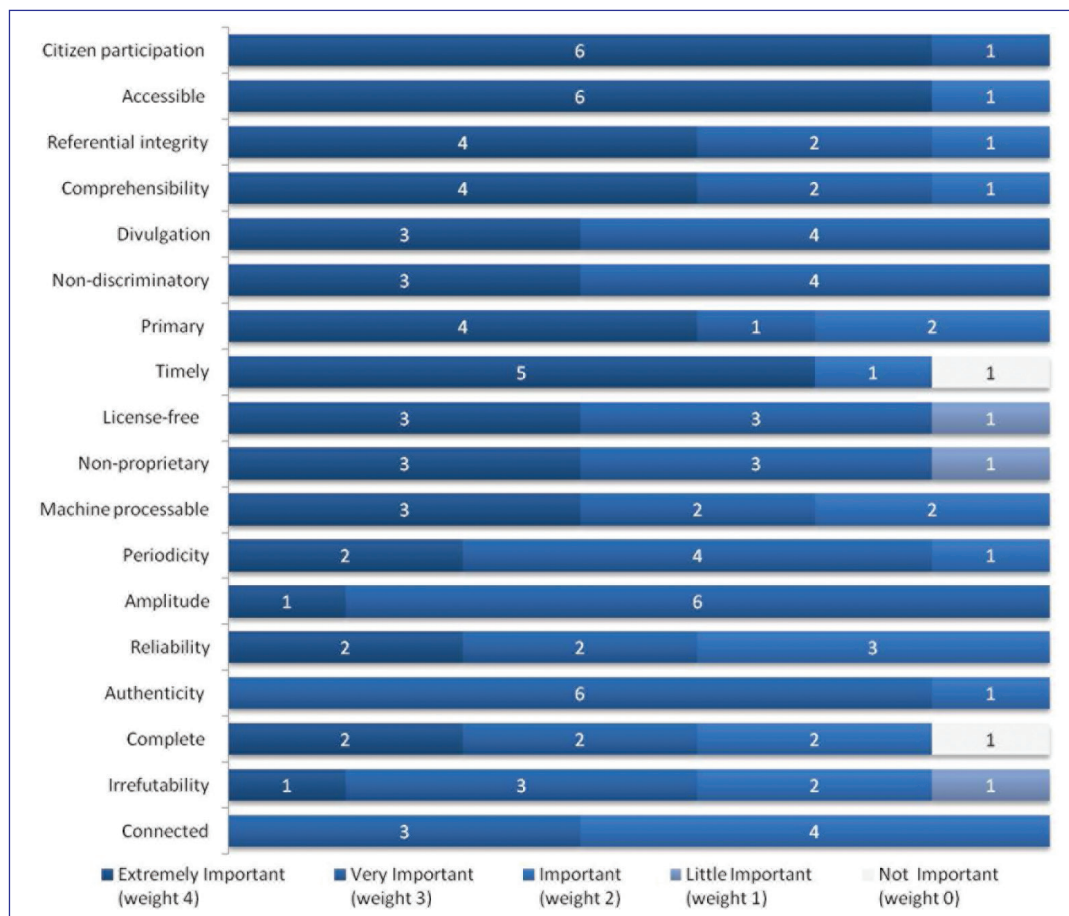
Source: Elaborated by the authors.

The 18 mechanisms obtained from the specialized literature were considered to be important by the majority of the respondents. Those who attributed lower degrees of importance justified the importance by order of prioritization in the implementation, considering the current situation of the Brazilian portals. Thus, all the mechanisms are important, but they should be implemented at the end. Therefore, the mechanisms received very positive evaluations—current practical problems were reported concerning the non-compliance of the mechanisms proposed in this study. However, during the treatment of the interview-support instrument, the respondents were asked to discuss the reasons for attributing some importance to each mechanism. Figure 6 presents a summary of the comments of the respondents who most clearly justified the evaluations of the mechanisms.

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Figure 6

Summary of the comments of the respondents during the interview

Respondent 5

"Data should be gradually disclosed until everything is disclosed [...] more you listen to the citizen better is the publications results [...] It is not easy for the government to identify OGD supply versus OGD demands [...] OGD supply is costly. [...] Government should establish win-win-win mechanisms among government agencies, that publish data, society and NGOs [...]"(verbal information).

Respondent 4

"[...] Referential Integrity mechanism is extremely important because it is a struggle to achieve that [...] allow cross-checking of databases for audit actions [..]Comprehensibility mechanism is strategic and precedes citizenship participation Non-discriminatory mechanism is very latent, we still require identification from who request OGD passively [...] "(verbal information).

Respondent 6

"Citizenship participation is limited to activists and academics [...]" (verbal information).

Respondent 1

"[...] I am assigning No Important to the Complete Data Mechanism because disclosing all government open data just harms portal usage [...] there is a lot of data [...] data need to be disclosed on demand [...] the same related to Timely mechanism, urgency in OGD publication depends on the need of use[...] Regarding the Comprehensibility mechanism , use of examples would also facilitate the understanding [...] "(verbal information).

Respondent 7

"Transparency does not require free licenses in all situations [...] the dialogue with society is fundamental [...] Linked data has a certain cost and time and needs training [...] in the moment of financial crisis it is difficult to justify [...] In relation to the Complete Data Mechanism [...] we still need a greater culture of transparency [...] there will also be greater difficulty in finding. Prioritization may be biased to not indicate weakness [...] "open washing" [...], but it is not enough to comply with Access Information Law [...] compliance with the law is premise. "(Verbal information).

Source: Elaborated by the authors.

During the interviews, suggestions of new mechanisms that could increase transparency in OGD portals were requested (Figure 7).

Figure 7

Additional mechanisms suggested during the interviews with experts

Respondent 7
Very Important
API which provides versioning. New URL to each new publication version, keeping the previous one for up to 3 months so applications can change to the new URL.
Important:
To publicize the publication versioning and to document the data source according to PROV-W3C.

Respondent 1
Extremely Important:
Process governance, including civil society from the outset. Goals plan agreed among the process actors. Presence of execution indicators.
Very Important:
Dissemination : real examples of OGD consumption that benefit the government and the population to realize the importance of the disclosure process.

Respondent 2
Extremely Important:
Involvement of multi-sectorial actors in the discussion of contents to be disclose on portals.
Very Important:
Comprehensibility: training on the disclosed data usage

Respondent 3
Extremely Important:
Defining rules related to which data should be made available first.
Very Important:
Implanting a forum on the data portal to share experiences on data usage and usage examples

Respondent 6
Very Important:
Laboratory in the cloud (data lake) for government/society co-creation and open data knowledge increase.

Respondent 4
Extremely Important:
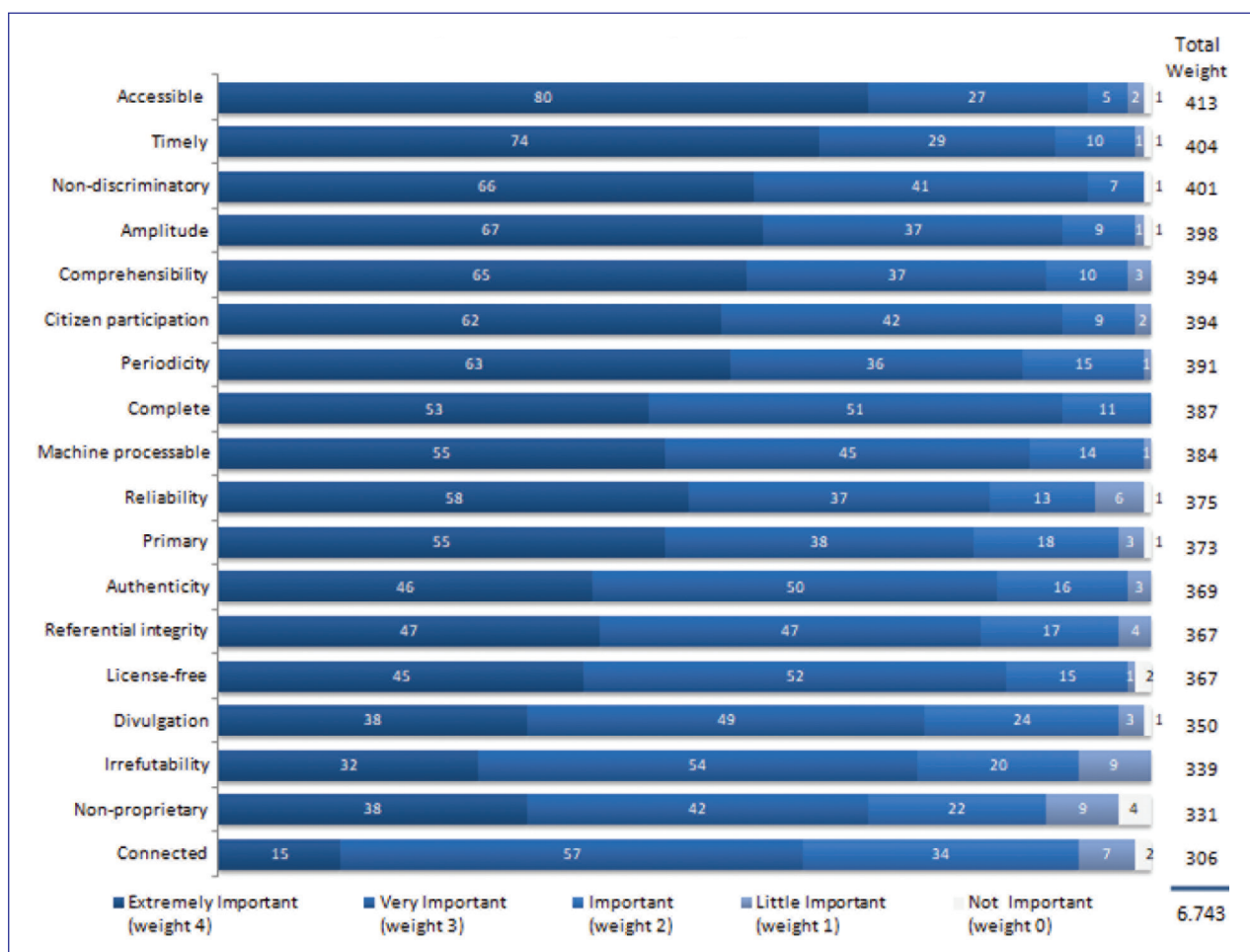Demand training. Identification of users necessities.

Source: Elaborated by the authors.

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The suggestions will be used in future collections in order to identify the degree of importance of each one from the perspectives of both data publishers and data users.

Classification by users of the mechanisms for increasing transparency

The result of the classification by degree of importance — obtained by means of the electronic data collection instrument — is shown in Graph 2, with the mechanisms in descending order of weight and the values of each bar showing the total number of respondents who attributed the respective level of importance to the mechanism. The last column was obtained by multiplying the total number of respondents by the weight related to each item of importance. This total weight will be used in the evaluation of the portal <http://dados.gov.br>.

Graph 2

Evaluation of importance from the perception of the OGD users

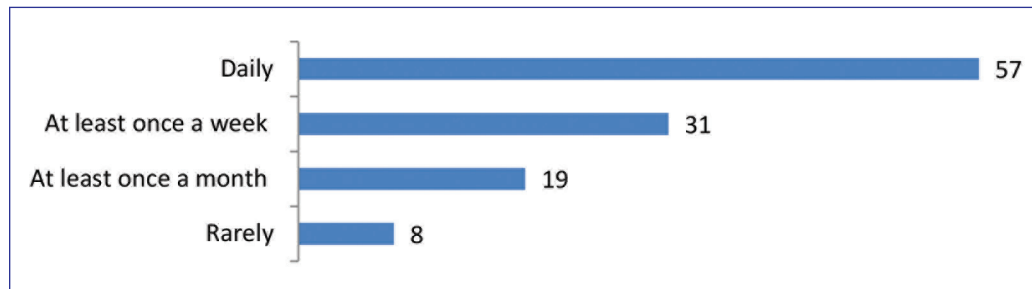| Mechanism	Extremely Important (weight 4)	Very Important (weight 3)	Important (weight 2)	Little Important (weight 1)	Not Important (weight 0)	Total Weight
Accessible	80	27	5	2	1	413
Timely	74	29	10	1	1	404
Non-discriminatory	66	41	7		1	401
Amplitude	67	37	9	1	1	398
Comprehensibility	65	37	10	3		394
Citizen participation	62	42	9	2		394
Periodicity	63	36	15	1		391
Complete	53	51	11			387
Machine processable	55	45	14	1		384
Reliability	58	37	13	6	1	375
Primary	55	38	18	3	1	373
Authenticity	46	50	16	3		369
Referential integrity	47	47	17	4		367
License-free	45	52	15	1	2	367
Divulgation	38	49	24	3	1	350
Irrefutability	32	54	20	9		339
Non-proprietary	38	42	22	9	4	331
Connected	15	57	34	7	2	306
						6.743

Source: Elaborated by the authors.

The 115 respondents of the study use OGD daily — in most cases, by means of active transparency, with the OGD made available on portals, or by passive transparency, with the OGD requested from the "Citizen Information Service", as shown in Graph 3, thus valuing even more the responses of these respondents.

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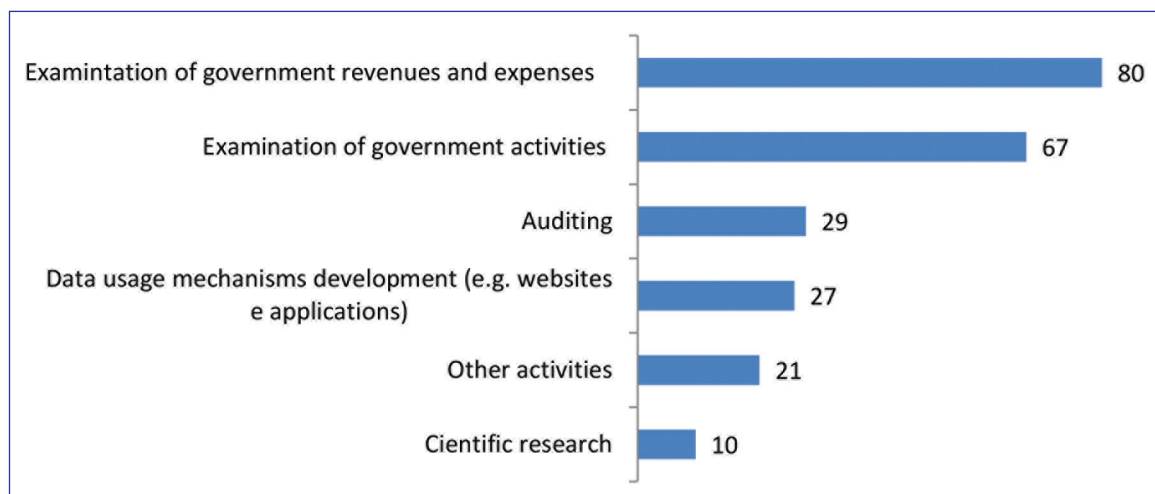**Graph 3**

Frequency of OGD use among users

Source: Elaborated by the authors.

The instrument used in the electronic collection allowed each respondent (OGD user) multiple choices in the definition of activities performed with OGD (Graph 4).

Graph 4

Activities done with OGD

Source: Elaborated by the authors.

The results show that from the perception of users, OGD cannot have their transparency measured only by technical aspects originated from the OGD principles of the OGWG defined in 2007. Nevertheless, they also cannot be measured based solely on the number of datasets made available because transparency is not an end in itself; i.e., it is not the ultimate purpose, and the amount of data must attend a purpose. In the case of the OGD users who responded to this survey, the main purpose was to obtain OGD that can make public agents accountable, not only in the sense of sanctions provided for in legislation but also in the identification of the people responsible who will be subject to various consequences, either negative and positive. At the very least, the proposed mechanisms were considered important by a wide range of users and for different means of using OGD in accountability, thus increasing the support for the results, in the increasing of transparency for this purpose.

The purpose of increasing transparency to attend the accountability process of the AT produced the greatest appreciation of the Amplitude, Periodicity, Comprehensibility, Reliability, and Authenticity mechanisms, in relation to the other mechanisms, due to the need for these mechanisms in the use of OGD for accountability.

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Thus, the results showed that according to the perception of these OGD users, the Amplitude mechanism is more valued than the Complete Data mechanism, meaning that the detailing and coverage of the OGD — in accordance with the legislation — are more valued than the publication in the OGDBP of all the public data, when this concerns increasing transparency for the purpose of accountability.

Application of the mechanisms in the analysis of the portal <http://dados.gov.br>

In Phase 3 of the study, the content of the Open Data Portal of the Brazilian Federal Government (<http://dados.gov.br>) was analyzed — it is a catalogue intended for the data federation, since it allows the publication of data from various sources of government data, from various spheres and powers. However, it mainly makes available data from the executive branch in the federal sphere.

From the definition of the weights of the mechanisms, defined by the OGD users in Phase 4, the points obtained by the portal <http://dados.gov.br> in each category were calculated — see Appendix A. Among the positive aspects of the content analysis of this portal, the author's recommendation of the datasets from the Economics and Finance category and in the Health category stand out — these correspond to indications of the Irrefutability/Author (Person) mechanism. The presence — in various datasets — of information about the periodicity was also identified; however, it was not being respected during the analysis. The edition number was informed in all datasets from this portal, which is evidence of the Authenticity mechanism. Another highlight was the divulgation of new datasets in social networks, and the promotion of hackathons on at least an annual basis —both of these are indicators of the Divulgation mechanism.

FINAL CONSIDERATIONS

Although the experts interviewed did not refute the mechanisms presented during the interviews, many indicators were not attended to during the analysis of the portal. Considering the positive opinions of the respondents about the mechanisms and the fact that the respondents have been involved, directly or indirectly, in the definition of publishing strategies on this same portal, it is possible to consider the mechanisms as an evolution on OGD publishing requirements. No technical or financial infeasibility related to the adoption of the presented mechanisms was mentioned during the interviews. The results of the mechanisms evaluation by the OGD users show their significant importance in OGD publications in the Brazilian context, even though some mechanisms were not yet present in the portal analyzed.

Considering the increasing importance of governmental actions transparency, the objective of this study was to identify the mechanisms that promote OGDBP transparency. The results obtained are relevant to the practice of public managers who want to assess the transparency and quality of open data portals and formulate strategies to disclose governmental data. The method to identify and define mechanisms that increase OGDBP transparency facilitates the understanding of criteria and reuse form of those mechanisms in the future. This method allows a comparison with other portals, serves as a benchmark for public managers, stakeholders, and researchers in the area, and enables a transparency ranking of the evaluated portals. The theoretical contribution comes from the unprecedented combination and verification of different mechanisms for increasing transparency to achieve accountability, which can be the basis of future researches.

All identified mechanisms were considered important, very important, or extremely important by 92% of respondents using OGD. These mechanisms broaden the principles of the OGWG (2016), with an emphasis on data reliability and the continuity of reuse of these data by different purposes.

The study demonstrated the performance of participatory democracy in the Brazilian context through the evaluations and opinions collected from social activism entities, such as the opinion of members of citizen observatories who use OGD for social scrutiny. Additionally, through the perception of users, the study showed that the OGDBP cannot have its transparency measured only by technical aspects such as the type of electronic file, the type of licenses, and machine processable. Nevertheless, transparency also cannot be measured based solely on the number of datasets available because transparency is not an end in itself, i.e., it is not the ultimate purpose, and the amount of data must attend a purpose to be defined.

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It is important to reflect on the main objective expected by the citizens who use OGD. According to the OGD users responding to this survey, the main objective was to inspect governmental and public agents accountability, not only on the legislation sanctions, but also to identify those who will be subjected to the consequences, either negative or positive.

The evaluation of the mechanisms by the perception of experts and particularly by the perception of OGD users shows the greater importance of data quality and stewardship of the correct OGD than data quantity. A large amount of OGD does not mean an increase in governmental transparency if the OGD does not have the quality and reliability provided by the information safeguard mechanism. In terms of government transparency, it is insufficient for the information to be suitable for the purpose if it is not suitable for the use.

The results also demonstrated that there is frequent use of OGD for accountability. The use of OGD by the citizen observatories is a good example. They use the data both in consultation with the OGDBP (active transparency) and in the requests to the information services for citizens (passive transparency). Nevertheless, the number of citizen observatories in relation to the number of Brazilian municipalities is low. Thus, it is suggested to identify in further researches the social and psychological aspects that motivate citizens to use OGD as a way to contribute to public agents' accountability, provided this participatory behavior in the accountability process is still incipient in the Brazilian population. Rousseau (1973) proposed the direct democracy, which currently relates to participatory democracy, because according to the author, democracy is that which places the popular will above individual interests and requires the constant popular approval on issues that regulate policies, not admitting the representation of this will. In the national context, the representative democracy seen in the elections overlaps participatory democracy, which could be more active by means of instruments such as OGD. Further studies can investigate the reasons for the existence of this difference in citizen participation between these two forms of democracy. It may be linked not only to compulsory voting in Brazil but also to the greater ease of participation through voting, in contrast to the processes of participatory democracy, which require greater involvement and effort on the part of the participating citizens. However, there may be others social and psychological factors responsible for this difference in engagement between these two forms of democracy.

Thus, the use of OGD by the minority of the population may also be related to the lack of divulgation, the difficulty in understanding the information regarding the public budget, and the low quality and lack of confidence in the data, as already discussed in the theoretical framework. These possible reasons are reinforced by the increased appreciation of the mechanisms suggested by this study, which provide the divulgation, comprehensibility, quality, and reliability of the OGD made available on OGD portals. In that way, to some extent, the groups of citizens that were respondents in this study (OGD experts and members of citizen observatories) do not represent the democratic activity of the majority of Brazilian citizens due to the large number of participants in the electoral process. Future collections that are able to obtain the perception of these other citizens may present different but equally important results.

This study also addressed the increase in transparency to attend the accountability process of the AT. Other objectives for increasing transparency, such as the innovation in or ease of access to public services, may enhance or revise the mechanisms suggested by this study.

This study did not explore many other objectives for increasing transparency, e.g., the innovation in or ease of access to public services, which can be considered a limitation. New studies may evaluate new objectives for increasing transparency in OGD, in addition to increasing the consistency of the scores attributed to the mechanisms proposed, through focal groups or Delphi techniques, emphasizing the opinion of OGD users. Additionally, these studies could check the relationships proposed in the conceptual model.

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REFERENCES

AKUTSU, L.; PINHO, J. A. G. Sociedade da informação, *accountability* e democracia delegativa: investigação em portais de governo no Brasil. **Revista de Administração Pública**, Rio de Janeiro, v. 36, n. 5, p. 723-745, 2002.

AL-JAMAL, M.; ABU-SHANAB, E. The influence of open government on e-government website: the case of Jordan. **International Journal of Electronic Governance**, v. 8, n. 2, p. 159-179, 2016.

ANDERSEN, T. B. E-government as an anti-corruption strategy. **Information Economics and Policy**, v. 21, n. 3, p. 201-210, 2009.

ATTARD, J. et al. A systematic review of open government data initiatives. **Government Information Quarterly**, v. 32, n. 4, p. 399-418, 2015.

BALL, C. What is transparency? **Public Integrity**, v. 11, n. 4, p. 293-308, 2009.

BARBOUR, R. **Grupos focais**. Porto Alegre: Artmed, 2009.

BARRY, E.; BANNISTER, F. Barriers to open data release: a view from the top. **Information Polity**, v. 19, n. 1-2, p. 129-152, 2014.

BRASIL. Decreto n. 7.185, de 27 de maio de 2010. **Diário Oficial da União**, edição extra, 27 May 2010. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/decreto/d7185.htm>. Accessed on: 08 Dec. 2016.

BRASIL. Decreto n. 7.724/2012, de 16 de maio de 2012. Regulamenta a Lei n. 12.527, de 18 de novembro de 2011, que dispõe sobre o acesso a informações previsto no inciso XXXIII do *caput* do art. 5º, no inciso II do § 3º do art. 37 e no § 2º do art. 216 da Constituição. **Diário Oficial da União**, 16 May 2012. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/decreto/d7724.htm>. Accessed on: 27 Mar. 2018.

BRASIL. Decreto n. 8.777, de 11 de maio de 2016. Institui a Política de Dados Abertos do Poder Executivo Federal. **Diário Oficial da União**, 12 May 2016. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/decreto/d8777.htm>. Accessed on: 27 Mar. 2018.

BRASIL. Lei Complementar n. 101, de 4 de maio de 2000. Estabelece normas de finanças públicas voltadas para a responsabilidade na gestão fiscal e dá outras providências. **Diário Oficial da União**, 5 May 2000. Available at: <http://www.planalto.gov.br/ccivil_03/leis/lcp/lcp101.htm>. Accessed on: 27 Mar. 2018.

BRASIL. Lei Complementar n. 131, de 27 de maio de 2009. Determina a disponibilização, em tempo real, de informações pormenorizadas sobre a execução orçamentária e financeira da União, dos Estados, do Distrito Federal e dos Municípios. **Diário Oficial da União**, 28 May 2009. Available at: <http://www.planalto.gov.br/CCivil_03/leis/LCP/Lcp131.htm>. Accessed on: 27 Mar. 2018.

BRASIL. Lei n. 12.527, de 18 de novembro de 2011. Regula o acesso a informações previsto no inciso XXXIII do art. 5º, no inciso II do § 3º do art. 37 e no § 2º do art. 216 da Constituição Federal; altera a Lei no 8.112, de 11 de dezembro de 1990; revoga a Lei n. 11.111, de 5 de maio de 2005, e dispositivos da Lei n. 8.159, de 8 de janeiro de 1991; e dá outras providências. **Diário Oficial da União**, 18 Nov. 2011. Available at: <http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2011/lei/l12527.htm>. Accessed on: 27 Mar. 2018.

CAMPOS, A. M. *Accountability*: quando poderemos traduzi-la para o português? **Revista de Administração Pública**, v. 24, n. 2, p. 30-50, 1990.

CARTER, L.; BÉLANGER, F. The utilization of e-government services: citizen trust, innovation and acceptance factors. **Information Systems Journal**, v. 15, n. 1, p. 5-25, 2005.

CONTROLADORIA GERAL DA UNIÃO – CGU. **Metodologia da Escala Brasil Transparente**. 2016. Available at: <http://www.cgu.gov.br/assuntos/transparencia-publica/escala-brasil-transparente/metodologia>. Accessed on: 14 Jan. 2016.

COOPER, H.; HEDGES, L. V.; VALENTINE, J. C. **The handbook of research synthesis and meta-analysis**. New York: Russell Sage Foundation, 2009.

CUNHA, M. A. V. C.; MIRANDA, P. R. M. O uso de TIC pelos governos: uma proposta de agenda de pesquisa a partir da produção acadêmica e da prática nacional. **Organizações & Sociedade**, v. 20, n. 66, p. 543-566, 2013.

CUNHA, M. A. V. C. D. et al. **Dados abertos nos municípios, estados e governo federal brasileiros**. 2015. Available at: <http://bibliotecadigital.fgv.br/dspace/bitstream/handle/10438/16373/Dados_Abertos_nos_Munic%C3%ADpios_Estados_e_Governo_Federal_Brasileiros_Volume_3.pdf?sequence=1&isAllowed=y>. Accessed on: 27 Mar. 2018.

DAWES, S. S. Stewardship and usefulness: policy principles for information-based transparency. **Government Information Quarterly**, v. 27, n. 4, p. 377-383, 2010.

DE FERRANTI, D. et al. **How to improve governance**: a new framework for analysis and action. Washington, DC: Brookings Institution Press, 2009.

DE KOOL, D.; BEKKERS, V. The perceived impact of open inspection data on the quality of education in Dutch primary schools: a parent perspective. **Social Science Computer Review**, v. 33, n. 5, p. 645-659, 2015.

FLICK, U. Introdução à pesquisa qualitativa. 3. ed. Porto Alegre: Artmed, 2009.

GIBBS, G. **Análise de dados qualitativos**. Porto Alegre: Bookman, 2009. (Coleção Pesquisa Qualitativa).

GRAVES, A.; HENDLER, J. A study on the use of visualizations for open government data. **Information Polity**, v. 19, p. 73-91, 2014.

HAIR, J. F. et al. **Fundamentos de métodos de pesquisa em administração**. 7. ed. Porto Alegre: Bookman, 2005.

HAIR, J. F. et al. **Análise multivariada de dados**. 6. ed. Porto Alegre: Bookman, 2009.

HARRISON, T. M. et al. Open government and e-government: democratic challenges from a public value perspective. **Information Polity**, v. 17, n. 2, p. 83-97, 2012.

HÖFFNER, K.; MARTIN, M.; LEHMANN, J. LinkedSpending: OpenSpending becomes Linked Open Data. **Semantic Web**, v. 7, n. 1, p. 95-104, 2016.

INSTITUTO DE ESTUDOS SOCIOECONÔMICOS – INESC. **Avaliando os websites de transparência orçamentária nacionais e subnacionais e medindo impactos de dados abertos sobre direitos humanos no Brasil**. Brasília, DF: Inesc, 2014.

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION; INTERNATIONAL ELECTROTECHNICAL COMMISSION – ISO/IEC. **Information technology**: security techniques – information security management systems. Overview and vocabulary. Geneva: ISO/IEC, 2014.

JANSSEN, K. The influence of the PSI directive on open government data: an overview of recent developments. **Government Information Quarterly**, v. 28, n. 4, p. 446-456, 2011.

KASSEN, M. A promising phenomenon of open data: a case study of the Chicago open data project. **Government Information Quarterly**, v. 30, n. 4, p. 508-513, 2013.

KHAYYAT, M.; BANNISTER, F. Open data licensing: more than meets the eye. **Information Polity**, v. 20, n. 4, p. 231-252, 2015.

KOUSSOURIS, S. et al. Accelerating policy making 2.0: innovation directions and research perspectives as distilled from four standout cases. **Government Information Quarterly**, v. 32, n. 2, p. 142-153, 2015.

LEE, G.; KWAK, Y. H. An open government maturity model for social media-based public engagement. **Government Information Quarterly**, v. 29, n. 4, p. 492-503, 2012.

LEONTIEVA, L. S. et al. Social-communicative innovations in anti-corruption activities (regional aspect). **Asian Social Science**, v. 11, n. 7, p. 387, 2015.

LERNER, J. S.; TETLOCK, P. E. Accounting for the effects of accountability, **Psychological Bulletin**, v. 125 n. 2, p. 255-275, 1999.

LINDERS, D. Towards open development: leveraging open data to improve the planning and coordination of international aid. **Government Information Quarterly**, v. 30, n. 4, p. 426-434, 2013.

LOURENÇO, R. P. An analysis of open government portals: a perspective of transparency for accountability. **Government Information Quarterly**, v. 32, n. 3, p. 323-332, 2015.

MALHOTRA, N. K. **Pesquisa de marketing**: uma orientação aplicada. 6. ed. Porto Alegre: Bookman, 2012.

MARAMIERI, J. Open government data: a citizen's right or a concession of public authorities? **Journal of e-Learning and Knowledge Society**, v. 10, n. 2, p.11-22, 2014.

MINISTÉRIO PÚBLICO FEDERAL – MPF. **Ranking Nacional da Transparência**. 2016. Available at: <http://www.rankingdatransparencia. mpf.mp.br/>. Accessed on: 09 Dec. 2016.

MURILLO, M. J. Evaluating the role of online data availability: the case of economic and institutional transparency in sixteen Latin American nations. **International Political Science Review**, v. 36, n. 1, p. 42-59, 2015.

NUGROHO, R. P. et al. A comparison of national open data policies: lessons learned. **Transforming Government: People, Process and Policy**, v. 9, n. 3, p. 286-308, 2015.

OPEN GOVERNMENT DATA – OGD. **Eight principles of open government data**. 2007. Available at: <https://opengovdata.org/>. Accessed on: 22 Apr. 2015.

OPEN GOVERNMENT WORKING GROUP – OGWG. **Open government data principles**. 2007. Available at: <http://www.opengovdata.org>. Accessed on: 08 Dec. 2016.

O'RIAIN, S.; CURRY, E.; HARTH, A. XBRL and open data for global financial ecosystems: A linked data approach. **International Journal of Accounting Information Systems**, v. 13, n. 2, p. 141-162, 2012.

PARCERIA PARA GOVERNO ABERTO. Encontro Nacional de Governo Aberto. **Notícias**, Brasília, 06 out. 2016. Available at: <http://www. governoaberto.cgu.gov.br/noticias/2016/i-encontro-brasileiro-de-governo-aberto>. Accessed on: 12 Dec. 2016.

PÉREZ, C. C.; HERNÁNDEZ, A. M. L.; BOLÍVAR, M. P. R. Citizens' access to on-line governmental financial information: practices in the European Union countries. **Government Information Quarterly**, v. 22, n. 2, p. 258-276, 2005.

PINHO, J. A. G.; SACRAMENTO, A. R. S. Accountability: can we now translate it into Portuguese? **Revista de Administração Pública**, Rio de Janeiro, v. 43, n. 6, p. 1343-1369, 2009.

PINSONNEAULT, A.; KRAEMER K. L. Survey research methodology in management information systems: an assessment. **Journal of Management Information Systems**. v. 10, n. 2, p. 75-105, 1993.

PRADO, E.; SOUZA, C. A. **Fundamentos de sistemas de informação**. Rio de Janeiro: Elsevier, 2014.

RAUPP, F. M.; PINHO, J. A. G. Accountability em câmaras municipais: uma investigação em portais eletrônicos. **Revista de Administração**, v. 48, n. 4, p. 770-782, 2013.

ROUSSEAU, J. J. **O contrato social e outros escritos**. 4. ed. São Paulo: Cultrix, 1973.

SÁEZ MARTÍN, A.; DE ROSARIO, A. H.; PÉREZ, M. D. C. C. An international analysis of the quality of open government data portals. **Social Science Computer Review**, v. 34, n. 3, p. 298-311, 2016.

SCHILLEMANS, T.; VAN TWIST, M.; VANHOMMERIG, I. Innovations in accountability: learning through interactive, dynamic, and citizen-initiated forms of accountability. **Public Performance & Management Review**, v. 36, n. 3, p. 407-435, 2013.

SOL, D. A. The institutional, economic and social determinants of local government transparency. **Journal of Economic Policy Reform**, v. 16, n. 1, p. 90-107, 2013.

SOLAR, M. et al. A model to guide the open government data implementation in public agencies. **Journal of Universal Computer Science**, v. 20, n. 11, p. 1564-1582, 2014.

STAMATI, T.; PAPADOPOULOS, T.; ANAGNOSTOPOULOS, D. Social media for openness and accountability in the public sector: cases in the Greek context. **Government Information Quarterly**, v. 32, n. 1, p. 12-29, 2015.

TANAKA, S. Engaging the public in national budgeting: a non-governmental perspective. **OECD Journal on Budgeting**, v. 7, n. 2, p. 139, 2007.

TETLOCK, P. E. Accountability and complexity of thought. **Journal of Personality and Social Psychology**, v. 45, n. 1, p. 74-83, 1983a.

TETLOCK, P. E. Accountability and the perseverance of first impressions. **Social Psychology Quarterly**, v. 46, n. 4, p. 285-292, 1983b.

TETLOCK, P. E. Accountability: a social check on the fundamental attribution error. **Social Psychology Quarterly**, v. 48, n. 3, p. 227-236, 1985.

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TETLOCK, P.E.; BOETTGER, R. Accountability: a social magnifier of the dilution effect. **Journal of Personality and Social Psychology**, v. 57, n. 3, p. 388-398, 1989.

TETLOCK, P. E.; BOETTGER, R. Accountability amplifies the status-quo effect when change creates victims. **Journal of Behavioral Decision Making**, v. 7, n. 1, p. 1-23, 1994.

TETLOCK, P. E.; KIM, J. I. Accountability and judgment processes in a personality prediction task. **Journal of Personality and Social Psychology**, v. 52, n. 4, p. 700-709, 1987.

TETLOCK, P. E.; SKITKA, L.; BOETTGER, R. Social and cognitive strategies for coping with accountability: conformity, complexity, and bolstering. **Journal of Personality and Social Psychology**, v. 57, n. 4, p. 632-640, 1989.

TOBER, M. PubMed, ScienceDirect, Scopus or Google Scholar: which is the best search engine for an effective literature research in laser medicine? **Medical Laser Application**, v. 26, n. 3, p. 139-144, 2011.

UBALDI, B. Open government data: towards empirical analysis of open government data initiatives. **OECD Working Papers on Public Governance**, v. 22, p. 1-61, 2013.

VANCE, A.; LOWRY, P. B.; EGGETT, D. Using accountability to reduce access policy violations in information systems. **Journal of Management Information Systems**, v. 29, n. 4, p. 263-290, 2013.

VANCE, A.; LOWRY, P. B.; EGGETT, D. Increasing accountability through user-interface design artifacts: a new approach to addressing the problem of access-policy violations. **MIS Quarterly**, v. 39, n. 2, p. 345-366, 2015.

VAN GREMBERGEN, W.; DE HAES, S.; GULDENTOPS, E. Control and governance maturity survey: establishing a reference benchmark and a self-assessment tool. **Information Systems Control Journal**, v. 6, p. 32-35, 2004.

VELJKOVIĆ, N.; BOGDANOVIĆ-DINIĆ, S.; STOIMENOV, L. Benchmarking open government: an open data perspective. **Government Information Quarterly**, v. 31, n. 2, p. 278-290, 2014.

VETRÒ, A. et al. Open data quality measurement framework: definition and application to open government data. **Government Information Quarterly**, v. 33, n. 2, p. 325-337, 2016.

WANG, H.-J.; LO, J. Adoption of open government data among government agencies. **Government Information Quarterly**, v. 33, n. 1, p. 80-88, 2016.

WANG, Q.; WALTMAN, L. Large-scale analysis of the accuracy of the journal classification systems of Web of Science and Scopus. **Journal of Informetrics**, v. 10, n. 2, p. 347-364, 2016.

WIRTZ, B. W. et al. Resistance of public personnel to open government: a cognitive theory view of implementation barriers towards open government data. **Public Management Review**, v. 18, n. 9, p. 1335-1364, 2016.

WORTHY, B. The impact of open data in the UK: complex, unpredictable, and political. **Public Administration**, v. 93, n. 3, p. 788-805, 2015.

YANNOUKAKOU, A.; ARAKA, I. Access to government information: right to information and open government data synergy. **Procedia: Social and Behavioral Sciences**, v. 147, p. 332-340, 2014.

YILDIZ, M. E-government research: reviewing the literature, limitations, and ways forward. **Government Information Quarterly**, v. 24, n. 3, p. 646-665, 2007.

ZELETI, F. A.; OJO, A.; CURRY, E. Exploring the economic value of open government data. **Government Information Quarterly**, v. 33, n. 3, p. 535-551, 2016.

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APPENDIX A

Table 1

Calculation of the degree of transparency of the <http://dados.gov.br> portal

dados.gov.br		Weight	Weight percentage	Scale factor	Ombudsman and publicity	Economy and Finance	Environment	Health	Energy	Education	Transportation	Infrastructure	Employment	Population
Amount of datasets on the portal						11	1	27	4	20	5	4	6	35
Accessible		413	100	6.12487	N/A	1	0	1	0.25	0.9	1	1	0.5	0.97
Timely		404	100	5.99140	N/A	0.45	0	0.52	0	0.05	0.2	0	0	0
Non-discriminatory		401	100	5.94691	N/A	1	0	1	1	1	1	1	1	1
Amplitude		398	100	5.90242	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comprehensibility	Data dictionary	394	30	5.84310	N/A	0.16	0.3	0.01	0	0.27	0.3	0.3	0.25	0.08
	Glossary		10		N/A	0	0	0	0	0	0	0	0	0
	Manual/Brochure		20		N/A	0.02	0	0	0	0	0	0	0	0
	Videos		10		N/A	0	0	0	0	0	0	0	0	0
	Tutorials		15		N/A	0	0	0	0	0	0	0	0	0
	Usage examples		5		N/A	0.01364	0	0.00185	0	0	0	0	0	0
	Games		5		N/A	0	0	0	0	0	0	0	0	0
	Ludic stories		5		N/A	0	0	0	0	0	0	0	0	0
Citizen participation in quality evaluation	Ombudsman/ "Contact Us"	394	20	5.84310	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Data classification by citizens		80		N/A	0	0	0	0	0	0	0	0	0
Periodicity		391	100	5.79861	N/A	0.45	0	0.52	0	0.05	0.2	0.75	0.17	0.51
Complete		387	100	5.73929	N/A	0	0	0	0	0	0	0	0	0
Machine processable	CSV/TXT Delimited	384	95	5.69479	N/A	0.69	0	0.18	0	0.19	0.57	0.24	0.16	0.16
	XLS/ODS		2		N/A	0.01	0	0.00074	0	0.008	0	0.015	0.003	0.003
	PDF		1		N/A	0	0	0	0	0.0005	0.004	0	0	0
	XML/JSON/ GeoJSON		100		N/A	0	0	0.78	0.25	0	0	0	0.17	0.66
	Others Structured formats		100		N/A	0	0	0	0	0	0	0	0	0
Reliability		375	100	5.56132	N/A	0	0	0	0	0	0	0	0	0
Primary		373	100	5.53166	N/A	1	0	1	0.25	1	1	1	1	1
Authenticity	Errata	369	30	5.47234	N/A	0	0	0	0	0	0	0	0	0
	Issue number		10		N/A	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Hash		60		N/A	0	0	0	0	0	0	0	0	0
Referential integrity		367	100	5.44268	N/A	1	0	1	0.25	0.9	1	1	0.5	0.97
License-free		367	100	5.44268	N/A	1	0	0.48	0	0.25	0.6	1	1	0.26
Divulgation	New datasets	350	90	5.19057	0.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Hackathon (annually at least)		10		0.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Irrefutability	Author (person)	339	5	5.02744	N/A	0.00455	0	0.00185	0	0	0	0	0	0
	Author (person) / electronic signature		95		N/A	0	0	0	0	0	0	0	0	0
Non-proprietary		331	100	4.90879	N/A	0.5	0	0.96	0.25	0.25	0.6	0.25	0.83	0.14
Connected	RDF/OWL	306	100	4.53804	N/A	0	0	0	0	0	0	0	0	0
Total		6743		100	5.19	4.66	0.26	4.73	1.49	3.15	4.13	4.20	3.52	3.72

Source: Elaborated by the authors.

Notes:

(1) Each mechanism has indicators, and each indicator is checked again for each dataset. Each mechanism has a maximum score of 1. Example: If a category has 27 datasets, and only 1 dataset has the requested indicator (as in the glossary case, which is worth 0.3 points), then the formula is as follows: 1/27 × 0.3 = 0.01;

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(2) The Amplitude was evaluated according to Decree no. 7.185/2010 (BRASIL, 2010), which determines the fields that should be made available when publishing budget data.

(3) The percentage of the weight of the mechanisms for each indicator—in the mechanisms that have multiple indicators—was evaluated by a focus group with 10 participants: one user who is part of a citizen observatory; four users-researchers involved in research on OGD, transparency, participation, and open government; and five professionals involved with the publication of OGD in Rio Grande do Sul. The recommendations of Barbour (2009) were followed in the focus group's planning and execution. The use of a focus group was decided upon due to the large number of indicators that would produce a very extensive electronic questionnaire, with constant sum scales for the distribution of the weight percentages of the mechanism between indicators, thus increasing the non-response bias (HAIR, BABIN, MONEY et al., 2005).

(4) The sum of the weights of all the mechanisms resulted in a value of 6743. For this value to conform to the scale ranging from 0 to 100, the scale factor formula was applied: scale factor = 100/6473 = 0.01483. This formula was adapted from the Brasil Transparente (Transparent Brazil scale (CGU, 2016). The weights of the mechanisms were multiplied by the scale factor such that the results stayed in the range from 0 to 100.