Assessing Open Government Budgetary Data in Brazil

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Abstract—**Budget transparency is an instrumental factor for better understanding the concept of budget within a democratic context. International codes for best governance practices in public management have appointed the internet as a communication media with the potential to provide this information in a timely and transparent manner to the several players in the society, and open government data has added important elements to this scenario. Currently, there is no structured framework to evaluate the quality of the budgetary information disclosed on the web. This paper takes this into consideration when proposing an assessment framework and analyzing data collected from two samples: one composed by 54 budgetary websites from different Brazilian executive power levels (national, state and municipal), complemented with another sample of 34 Brazilian audit court websites.**

Keywords-Budgetary web sites; budgetary disclosure assessment; open government data

I. INTRODUCTION

Accessing public finance information is essential for transparency in government actions in order to increase its confidence and accountability. The movements New Public Management and New Public Financial Management [1, 2] state the importance of transparency as a prerequisite for accountability. According to OECD [3] "access to information, consultation and active participation in policy-making contributes to good governance by fostering greater transparency in policy-making; more accountability".

The use of Information and Communication Technologies (ICT) in Public Administration is linked to the New Public Management [4]. In this context, the publication of information on websites on public financing, can be observed in many countries since the early 2000s [5]. Usually, these portals publish budget laws, definitions and other technical supporting documents for the interpretation of published financial data. Regarding monitoring of budget execution afforded by websites, data is usually published both in regard to past years as well as to the current year. It is important to note that the websites have different refresh rates of information about income and expenses for the current year, which may occur monthly, weekly or daily. The level of detail, the formats used and the quality of accounting information are also very heterogeneous, usually

corresponding to the government's commitment to transparency [6].

Research on budgetary and financial information disclosure has been done since early 2000s; but, since 2009 Open Government initiatives [7, 8] have been adding new elements in the discussion. Open Government Data (OGD) initiatives emerged worldwide aiming to make public data freely available to everyone, without restrictions. However, despite its potential, there is currently a lack of roadmaps, guidelines and benchmarking frameworks to drive and measure OGD progress.

The publication of open government data on the web has great potential as pointed by [9]. However, the literature on governmental budgetary website evaluation does not provide a structured framework for assessing the quality of budgetary information disclosed to citizens. Therefore, the aim of this paper is of bridging this gap. In the pursuit of this goal, this paper proposes an assessment framework, which is based on the eight Open Government Data Principles [10]. The framework is then applied to assess 88 Brazilian open government data websites, a sample composed by different levels of the executive power (national, state and municipal), and complemented with all Brazilian audit courts.

The remainder of the paper is structured as follows. Section 2 makes a summary of the most relevant literature on governmental budgetary websites and also on the principles of open government data. Section 3 addresses the methodological issues, firstly presenting the aspects observed, including how they have been defined, then establishing the hypotheses, and finally, describing the sample, model and analysis procedures. Section 4 presents the main findings of the study, and Section 5 summarizes the conclusions.

II. BACKGROUND

The international codes of good governance practices in public management, especially for the codes developed by the Organization for Economic Co-operation and Development (OECD) [3], International Monetary Fund (IMF) [11] and by International Federation of Accountants (IFAC) [12], as well as suggesting the actions that are translated into good practices, have also appointed the Internet as a communication media with the potential to

provide information in a timely and transparent manner to the several social players.

In Brazil, the legal recommendation [13, 14, 15] demands the public entities to disclose in real time, detailed information on the financial and budget execution, in accessible electronic media, with the objective of promoting the monitoring by the society of the usage of public resources and hold the managers who do not abide by the norms accountable.

In answer to the legal requirements, each member of the Federation sought its technological solutions, according to the principle of autonomy in the Federal Constitution, with different providers or creating its own technology teams. In this research, one can notice that even with structure and vocabulary defined by law, the information found in transparency pages from different members of the Federation bring different information, even if with a common budgetary legislation for all.

In this context, it is also important to place the existence of institutional controls on public accounts. The scrutiny of public accountancy in Brazil occurs similarly to other countries, where the creation of accountancy control institutions took place concomitantly to the modernization or monarchies or changes to the republican regimen [16]. Currently in Brazil, there are two financial control systems on the government accounts: internal control, performed by the own entities in the state apparatus, and an external control, performed by the Legislative Power, which has the aid of audit courts [17]. Thus, it is understood that by autonomy, the audit courts originate from a differentiation process in relation to the executive power - regarding the control of public finances - and legislative power - regarding the control of executive acts.

The external control is destined to prove: the probity of administrative acts; regularity of public expenditure and use of public goods, values and money; the faithful execution of budget. Also, as mentioned by [16], the external control should enable dialog channels with the civil society, with the objective of promoting social control on public administration so that any citizen, political party, association or sindicate - which are legitim parts, can inform irregularities or illegal acts.

In Brazil, the audit court system includes an audit court for the federal level (central government), 27 audit courts in states and Federal District. Most of them, that is, 23 state level audit courts, are responsible for auditing both the state and its municipalities accounts, and only 4 of them have the task of controlling exclusively state public accounts. Additionally, the audit court system has 6 audit courts: 2 for large municipalities (São Paulo and Rio de Janeiro cities), and 4 audit courts for municipalities, belonging to 4 states. All of these 34 audit courts have their own institutional websites on the internet, and the large majority publishes information for the society to follow, not only on public accountancy, but also on its audits.

A. Assessment of government portals

Many studies have been dedicated to the theme of quality in the disclosure of government information, especially budgetary, through internet portals. This section describes works that have contributed both with assessment methodologies and reflections about financial data disclosure in a particular locality.

Groff and Pitman [18] have studied 100 largest US Municipalities in order to establish a baseline against which to compare the growth of internet reporting. The items assessed were budgets and comprehensive annual financial reporting (full and summary statements).

Some aspects concerning content and design of the websites for financial reporting were evaluated in [19]. In this work, an index is proposed that comprises the type of financial information (including budgetary information and management indicators), quality of financial reporting contents, and user-friendly characteristics of website design (e.g. navigability and interaction conditions, easiness to manage and identify information). They have evaluated some Central Administrations of EU member-States. In another work, Rodríguez Bolívar [20] studied budgetary and financial position information disclosure as well as qualitative characteristics; performance indicators and the way the website is designed, tools it uses and the navigation system (e.g., easiness of interaction with potential users). Bolívar [21] propose an index which evaluates Internet-based financial information, based on the Spanish regional accounting standards. The index items embrace financial, budgetary and non-financial information for comparing accounts in hard-copy format with internet disclosure.

Similar concerns are observed to Caba et al. [22] who studied the disclosure at the municipal level (Spanish Municipalities) and proposed a disclosure index to compare paper-based financial reporting with internet financial reporting, considering information quality characteristics. Their index assesses three dimensions: financial information that websites should include, the characteristics of the contents included, and the website design to make information more accessible.

Transparency, interactivity, usability and website maturity are dimensions in the index proposed by Pina et al. [23]. A scoring system for the analysis of government financial disclosure in the internet assigns different weights to the dimensions, giving preponderance to transparency and interactivity. They have used the Web Site Attribute Evaluation System (WAES) methodology and surveyed some European regional and local government websites.

Pina et al. [24] have surveyed five local government web sites (the web site of the capital and the four subsequent largest cities) from 15 European web sites. Their survey has two groups of items of financial and non-financial information: items relating to financial accountability published through the Internet (economic and financial information performance, social and environmental information) and items relating to transparency, interactivity, usability and website maturity.

The municipal level is also studied by Jorge et al. [25]. This research combines items of budgetary and financial information to be disclosed with availability options, namely access/visibility, format and delivery mode and propose an disclosure index. They have evaluated a sample of 94

municipalities institutional websites, 49 from Italy and 45 from Portugal.

In the Brazilian context, Cruz et al.[26] has studied the transparency level of information in public administration published in the websites of 96 Brazilian municipalities included among the 100 most populous. They try to verify which characteristics and socioeconomic indicators of the municipalities can contribute to explain the level of transparency observed. The level of transparency in public administration was established from a research model called Transparency Index Municipal Public Management (ITGP-M) constructed with basis on international codes of good governance and transparency, the Brazilian legislation and the experiences of previous studies of similar nature conducted in Brazil and abroad. This index has 6 categories (general information on the municipality, municipal manager and councilors; municipal laws and municipal planning instruments; financial information, accountancy and fiscal reports; information on the interaction with citizens and society; analysis of the municipal portal; and quantitative and qualitative information on management).

Also within the Brazilian context, Ribeiro [27] evaluated two governmental portals under the transparency point of view. This evaluation had the investigation of the characteristics of the websites, and the implementation of WEAS evaluation methodology. The evaluated portals were the public purchase government portal (ComprasNet), and the Transparency Portal of the Federal Government. However, it is worth mentioning that the method applied presents limitations, such as not analyzing the quality and depth of published information, accessibility; specific problems in Brazil, such as digital exclusion; and the main issue: the model is not updated (its last version dates from 2001). Furthermore, it is important to note that none of the papers reviewed in this section explicitly addresses Open Government Data, which is the topic of the next section.

B. Open Government Data disclosure evaluation

As mentioned in Section 1, Open Government Data (OGD) introduces new possibilities to improve transparency, accountability and social participation, which are fundamental to financial information disclosure. Although there are some works that address the evaluation of OGD quality, these are not linked to the specific financial/budgetary domain. These works will be reviewed as specified below.

Braunschweig [28] presents a more technical evaluation on the state of open data portals, aiming to check not only if the data are available, but how and in which format this is made. The authors analyzed 49 existing open data portals from several countries and different organizational levels (municipal, state, federal and even international ones). Then, they crop this sample, and perform a deeper analysis in only 5 of these portals. Based on the observations made, the authors propose some standardizations, such as the presentation of data that can be re-used, which can be read by machines (and software). For the analysis of the 49 portals, which they named global view, the authors created ten indexes that were observed for each portal: Number of

published datasets (ND), Existence of standardized metadata attributes (SM), Standardized file formats (SF), Standardized domain categories (SC), Standardized spatial (SS)/temporal metadata (ST), Existence of an API (EA), API granularity: access to metadata or data (AG), Curation (CR) and Latest date of activity (DA). In the detailed view of the five portals, they created four indexes, namely: Downloadable Datasets (DD), Machine-readable Datasets (RD), Existence and number of tags (NT) and Existence and length of description (LD).

In this context of availability of government data, the term Open Government Data (OGD) was coined, which became popular at the beginning of 2008, after the publication of a set of OGD principles by lawyers in the USA, in December 2007 [10]. OGD is that any data produced by public sectors for anyone to use for any purpose [1] and the principles aiming to ensure the right to information are [10, 28]:

1) *Complete: All public data is made available. Public data is data that is not subject to valid privacy, security or privilege limitations.*
2) *Primary: Data is as collected at the source, with the highest possible level of granularity, not in aggregate or modified forms.*
3) *Timely: Data is made available as quickly as necessary to preserve the value of the data.*
4) *Accessible: Data is available to the widest range of users for the widest range of purposes.*
5) *Machine processable: Data is reasonably structured to allow automated processing.*
6) *Non-discriminatory: Data is available to anyone, with no requirement of registration.*
7) *Non-proprietary: Data is available in a format over which no entity has exclusive control.*
8) *License-free: Data is not subject to any copyright, patent, trademark or trade secret regulation. Reasonable privacy, security and privilege restrictions may be allowed.*

III. ASSESSMENT FRAMEWORK

The assessment framework proposed here encompasses the application of a survey to check the quality of budgetary data available in open government data portals. The framework is based on the eight open data principles [10], which are interpreted for the specific context of budgetary data based in good practice codes, regulations and applicable laws, namely:

- Manual on Fiscal Transparency (FMI, 2007);
- Brazilian Federal Republic Constitution;
- Complementary Law n.101/2000;
- Complementary Law n.131/2009;
- Law n. 4.320/1964;
- Technical budget manual 2012

This research was based on the eight open data principles mentioned in the previous section. Some explanations on their connection to this paper are given below.

In budget, there are two large information groups annually planned: revenues and expenses. In order to identify the compliance to the first principle - data must be complete - it was necessary that the portal presented these two groups in a temporal series.

The Brazilian budget, both for revenue and expenses, has a hierarchical classification in six levels. For example, in revenue, these levels are respectively economic (1), origin (2), species (3), approval (4), item (5), subitem (6). In this hierarchy, each sublevel is a detailing of the immediately prior level, that is, the total in origin (2) is the sum of all expenses in species (3). Thus, level 1 is the most aggregated and level 6 is the most primary.

For the third principle, data must be updated. Data from the last revenue or expense published were considered. On the access to data, forth principle, the attempts to download datasets through addresses provided in the transparency portals were checked. Also, the downloaded file should contain budget data to be considered accessible. If the data did not exist, it was not considered accessible.

The fifth principle, data must be processed by machine, was dealt in three issues since it depends on data being able to be accessed by machine, be downloaded and be in non-proprietary format in order to be read and processed. It also considered possible technologies that make difficult the access by machines, such as the use of CAPTCHA [29], a technology which depends on human intervention to access data. It can be observed that the eight principles have some intersection and/or dependency, such as in the two first ones. Data is not expected to be primary if they are not complete, nor that they can be processed if their format is not accessible.

For the sixth principle, non-discriminatory, it considered the need of some special access or enrollment. If there is no need to provide information for access the data were considered non-discriminatory. The seventh principle, data must be non-proprietary. It dealt on the observation of some options for known formats (PDF, CSV, XLS, XML) and an open field for unforeseen cases. The eighth principle, data must have free licenses, was also dealt as a single issue on the existence of usage licenses for data and if there is any restriction on them.

For this research, the parameters considered from [28] were: Standardized domain categories (SC), Standardized file formats (SF), Existence of an API (EA), API granularity: access to metadata or data (AG), Latest date of activity (DA), Downloadable Datasets (DD), Machine-readable Datasets (RD).

Number of published datasets (ND) is not part of our research since it is not about a data catalog, but only budget portals. The authors have not used the parameter Existence of standardized metadata attributes (SM) since there is no metadata standards in Brazil, even the well-know metadata standards such as Dublin Core [30] are not mentioned in the Brazilian documents like technical budget manual [31]. Also due to the absence of standards, the parameters Standardized spatial(SS)/temporal metadata (ST) were not considered. On Curation (CR), data from audit courts were considered curated data, but there is no equivalence of this parameter to

TABLE I. SUMMARY OF THE ASSESSMENT FRAMEWORK

Open Data principle	Our Framework
1 Complete	presence of information on revenues and expenses Standardized domain categories (SC)
2 Primary	observation of categories and phases in revenues and expenses Standardized domain categories (SC)
3 Timely	Date of the last update in 2012 must be of 48 hours. Latest date of activity (DA)
4 Accessible	publication on the web (valid links, not empty datasets) Downloadable Datasets (DD)
5 Machine processable	Existence of an API (EA), API granularity: access to metadata or data(AG), Machine-readable Datasets (RD)
6 Non-discriminatory	check the need of any special access or enrollment
7 Non-proprietary	Standardized file formats (SF)
8 License-free	existence of licenses for data usage and if there is any restriction to them

the eight open data principles. The parameter Existence and number of tags (NT) was not included since this parameter was considered, in the case of the Brazilian budget, equivalent to SC. Existence and length of description (LD) was not included since that for the data domains there are public budget manuals as well as legislation.

Table 1 summarizes the explanations on the framework.

IV. METHODOLOGY

Brazil has 5,565 municipalities, which belong to a federal district, and 26 states in the Brazilian federation. The study, as well as analyzing the federal government site, analyzed all portals from the 26 state governments and federal district, seeking to survey the reality of information offered in federal and state levels. At municipal level, at this point, the authors opted to investigate all capitals in the states and the federal district. In this manner, the criterion adopted was the cropping of 27 municipalities, which gather over 40% of the population in the country, rendering the study relevant, once it investigate information related to public management for a significant percentage of the Brazilian population, which answers for the largest part of all richness produced in the country.

The audit courts sites also compose another sample. All entities controlling the accountancies at municipal (6), state/municipal (4), state (23) and federal (1) levels were evaluated, with a total of 34 portals. From the collection of data in the 54 sites from the executive power and the 34 portals from control entities, we attempted to obtain 309 datasets theoretically offered, but it was only possible to download a total of 268 valid datasets, which were also evaluated. Craveiro et al. [32] made available all datasets collected and analyzed on the web.

Data collection, including the survey of municipalities and addresses of corresponding sites, data observation and analysis, information and services available on the portals, was performed between the months of August to October,
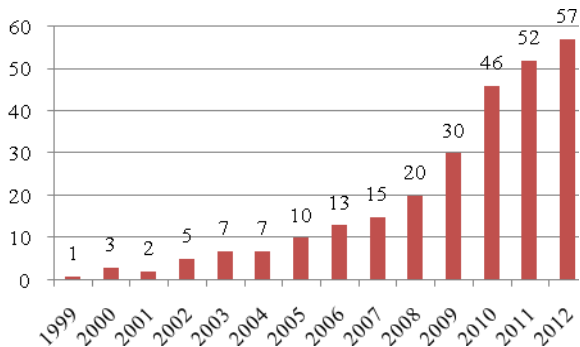
Figure 1. Datasets downloaded with data per year

Figure 3. Primary level of revenue datasets from 2009 to 2012

2012. In order to identify the websites of the municipalities, search machines were used, adopting as a standard expression "*Portal de transparencia* [*nome do município ou estado ou federal*]" (Transparency portal [name of the municipality or state or federal].

The collection of data from the portals, from the proposed assessment framework (Section 3) was performed following the procedure: when accessing the homepage, the content was accessed through the map of the site. When the homepage did not have a map of the site, the search was performed through the links existing on the main page; the information not found was sought through the search service, if it was available on the site.

V. RESULTS AND DISCUSSION

This section presents the results from the collection and analysis of data from the sample and discusses these results, organized according to the eight open data principles. In Figure 1, there is the distribution of datasets found with valid data, i. e., excluding download problems or absence of data in the files. It can be noticed that the most prominent increase is between 2009 and 2010.

In order to check the first principle of OGD, data was considered complete, at the budget domain, when both revenue and expense are published. Some portals provided more than one dataset for revenues or expenses, but for this analysis, only one dataset for each type per portal was considered. In this paper is presented only 2012 overview because there are more datasets offered. Figure 2 shows
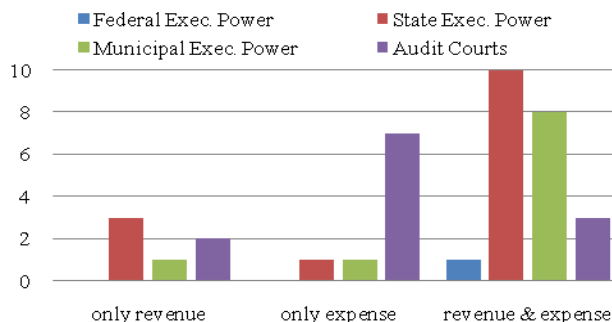
information type disclosure: only revenue, only expense or both. Regarding the information provided in our budgetary websites sample, majority of executive power entities publish both expense and revenue, and audit courts mainly just expenses. It can be seen that 22 of 37 (59.46%) budgetary portals present both revenues and expenditures.

The assessment of the second principle was based on the classification of the Brazilian budget. From the 268 valid datasets downloaded from several years, 60 had revenues for 2012. In Figure 3, it is shown, between parenthesis, the number of datasets found for revenues between 2009 and 2012 using a scale corresponding to the classification of revenues: no classification (0), economic(1), origin(2), species(3), approval(4), item(5), subitem(6) category; a revenue dataset is only considered primary if it is classified as 6, otherwise, it only contains aggregated values. If a dataset is classified until species, it is accounted as 3. Therefore, six from the 60 datasets (10%) classified the expense only in economic, origin and species category. An increase from 31 datasets in 2009 to 60 in 2012 can be noticed. However, there is an increase in datasets that do not have the classification of the revenue.

Figure 4 presents the number of datasets found for expenses between 2009 and 2012, with the total of datasets between parenthesis, with a classification scale for expenses similar to Fig. 3: no classification(0), entity(1), budgetary unit(2), function(3), sub-function(4), program(5), action(6). In the same manner as the revenues, data are considered primary when classified as 6. Despite the smaller difference

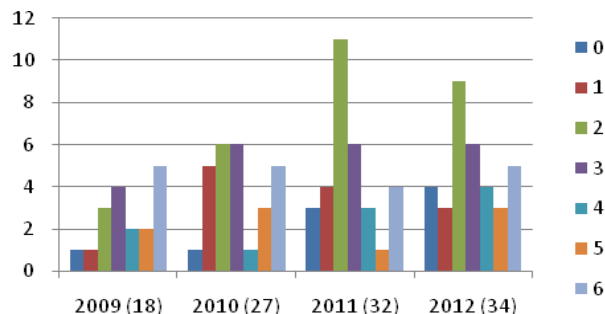Figure 2. Number of budgetary portals, 2012 overview

Figure 4. Primary level of expenses datasets from 2009 to 2012

between datasets classified as 0 and 6, the majority of data for expenses is not provided with detailed budgetary classification.

Among revenues and expenditures, 52 datasets were classified as primary, in total of 303 datasets from 2009 to 2012. Thus, in the considered period 17.16% of datasets are primary.

Considering the datasets for 2012 from executive entities, the average delay in publishing the budget was 1.4 months, being noticeable that for the State of Rio Grande do Sul, between the years 2006 and 2011, the last expense registered ranged from April and June, that is, for the previous years, there was a semester of information lacking on the expenses for this State. In the four audit courts presenting data for 2012, the average delay was of 5 months, which can be considered normal once the courts need to audit the public accounts. Since [14] also it demands budget data to be available in real time, in the Brazilian scenario we considered that the 'timely' principle is not met in the transparency portals, with only one dataset presenting a delay of one day and another one of two days, that is, 4.4% of the portals published the data in a satisfying time.

In order to assess the accessibility of data, forth principle, all attempts to download data were considered, being successful or not. From 309 attempts, 32 did not have files, from the 277 datasets downloaded, 9 did not contain data, remaining 268 datasets (86.73%). Even if the data can be accessed in most of the portals, over 10% access problems is significant, with a total of 41 datasets not found.

In order to analyze data that can be processed by machines, fifth principle, it could be seen that some technology would hinder the automatic downloading of data and format of the downloaded file. From the 88 portals visited, five redirected to a different address, which can impair the automatic access, and in one of them, human intervention was necessary due to the CAPTCHA technology. Most of the files were in PDF (50.72%), followed by CSV (30.07%) and XLS (19.20%). The greatest problem found was in the format of the downloaded file, where we only considered machine-processable those in CSV format. It is known that the format XLS/X despite being proprietary, has open specification [33], which makes the data accessible with the use of tools for the reading of this format, similar to a non-proprietary format. Even though XLS/X is similar to an open format, the majority of datasets are in PDF, which forbids reading by machines.

The majority of transparency portals (98.82%) meet the sixth principle - non-discriminatory access. Only the Audit Court from the State of Amapá requests enrollment for access to data.

Coincidently, as the analysis of the fifth principle resulted in the discussion of file formats, on the seventh principle, non-proprietary formats, it can be seen that only 30.07% datasets are in non-proprietary formats. Thus, in the Brazilian scenario, this principle is not met.

In no portal licenses for the data were found. This does not restrict the use, but it does not provide guarantees to the citizen. The Brazilian Freedom of Information Act establishes that information on government management is a
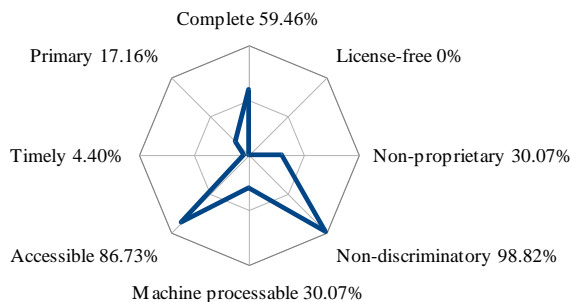
Figure 5.   Compliance of sample with OGD principles

priori public. However, the absence of a license allows that in the future, the data be licensed in a restrictive manner.

Figure 5 summarizes the compliance of the sample in this article with the OGD principles. The authorsobserved that only the principles Complete, Acessible and Non-discriminatory are in compliance greater than 50%. On the other hand, only 4.4% of the analyzed sites provide timely information and only 17.16% comply with the principle of providing primary data.

As a result, it was noticed that adherence to the first two principles of open data - regarding complete and primary availability of data, respectively - is different in executive power portals, which normally provide both revenue and expenses, and in control entity portals, which focus on expenses. Regarding the quality of data available, it can be noticed that there is a tendency of growth in the amount of data available, but also that the majority of new data are not detailed (primary). This result might indicate that the Brazilian budgetary data portals are making efforts to meet the legal transparency requirements, but that the concern with the quality of data made public still needs to be reinforced.

Regarding the remaining principles, a weak adherence to the timeliness principle could be noticed, since only 4.4% of the portals visited published updated data in the two previous days. Thus, most Brazilian budgetary open data portals are yet to comply to the legal requirement of publishing in real time. Regarding the other principles, it can be noticed that many portals are already satisfactorily meeting the principle of non-discriminatory access. However, there is still the need of improving the accessibility of data (over 10% datasets analyzed could not be accessed) and the capacity of machine processing (over 50% data is still made available in PDF format, hindering its processing). Finally, the principle of free licensing of data is not followed by any of the portals analyzed, which must be object of consideration and action by public policy decision making entities in order to ensure the compliance to the legislation that indicates that government management information must be public.

VI. Conclusion and Future Work

This article proposed an approach for the evaluation of budgetary government data portals in Brazil. A robust and thorough assessment framework was defined, considering the principles of open data, good practices in the disclosure

of governmental budgetary data and specific aspects in the Brazilian legislation. This framework was applied in the assessment of 88 Brazilian government budgetary data portals.

In this manner, this study makes three main contributions to the research on open budgetary government data. First, it proposes an assessment framework that integrates both open data quality and budgetary information disclosure, aiming at contributing to both research areas. On the one hand, our framework enables a more thorough examination of the format with which budgetary data is disclosed in open government data portals, what is not accomplished by previous work that analyzed transparency portals. On the other hand, our assessment framework includes specific requirements of the domain of budgetary data, thus making the evaluation of the adherence to the principles for open government data more tangible and precise.

Second, few studies hitherto have surveyed budgetary disclosure information in various levels, and in the case of Brazil, ours is the first one. Finally, as far as the authors know, there are no research results available that compare the information quality level disclosed by public entities that execute budget with entities that have the responsibility for supervising it. This work presents an assessment not only of the disclosure procedures of the entities responsible for making government data available (i.e. the executive power), but also from the institutions that must audit these data to detect irregularities and publicize them for the general public.

The authors expect this paper to bring new elements in order to improve transparency and accountability as a whole in the public budget matter. The intention is to extend this work by creating an index based on the assessment framework presented here, so as to enable a classification that indicates the quality of the disclosure procedures of public entities regarding open government budgetary data. Future work could also extend the proposed framework and perform empirical studies for establishing relationships for the impact of perceived usefulness and perceived ease of use of the websites. Additionally, the authors intend to expand the framework to consider further technical aspects of the data disclosure, such as the use of Application Programming Interfaces (APIs) and the availability of metadata.

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