# Deconstructing government budgets through visual representation software

Jesús García-García (jesgar@uniovi.es) [correspondence autor]

*Department of Accounting, University of Oviedo, Oviedo, Spain*

*Business and Economics School. Avenida del Cristo, s/n. 33006 Oviedo (Spain)*

María Isabel Alonso-Magdaleno (ialonso@uniovi.es)

*Department of Business Administration, University of Oviedo, Oviedo, Spain*

Jesús García-García is a senior lecturer of accounting at the University of Oviedo (Spain). His research mainly focuses at the interaction of people and digital technology in public sector management and accountability.

María Isabel Alonso-Magdaleno is an associate professor of management at the University of Oviedo (Spain). Her research interests are on the analysis of socio-economic systems, and management and efficiency on public and private sector.

Funding: We acknowledge support from University of Oviedo research grant PAPI-19-EMERG-16.

Data availability: Anonymized data set is available from the correspondence author upon request.

# Deconstructing government budgets through visual representation software

Budget visualization tools facilitate the communication of complex technical information. In this paper, the main technical, individual and organizational factors that affect its implementation and use is analysed. Through a questionnaire survey data have been collected from those responsible for the adoption and maintenance of the two principal web applications in 34 Spanish regional and local governments. Findings show that these tools have some users but that their main target are not citizens but specific groups, mainly media and political groups. Its adoption is neither a budgetary nor technological problem. The impulse for adoption is mainly political, with the focus on financial and budgetary transparency but sometimes also on participatory transparency or micro-transparency. Finally, a serious risk of governance generated by the lack of clear transparency and accountability strategies in the administrations is detected, as well as an absence of operational procedures to adapt to the changing budgetary structure.

Keywords: visualisation, budget, public innovation, web, transparency, open data.

## 1. Introduction

The budget is a key instrument of public management that displays a comprehensive economic, financial and accounting expression of the policies developed by an administration during a calendar year, both at the forecast and at the execution level. Its nature is at the root of the democratic process of legitimacy and accountability, revealing the link between the resources that a public administration gets from citizens and the use made of them. This avoids the arbitrary and abusive handling of power and ensures efficient and effective operating of the public sector. Therefore, it should be used for social deliberation, manageable by large parts of the population, understandable in its contents and easily available in digital formats. The main concern is that access to budgetary data is usually provided through documents that are barely intelligible to the average citizen, since its original intent as a managerial tool for public resources is unfavorable to advance in governmental accountability for the citizenry at large.

In recent years, the concept of open government, with its emphasis on open public data as a source of transparency, participation and collaboration, has been paramount for the accountability of governments. There is a widespread belief that more transparency in governments leads to better outcomes, something that might just be overly optimistic (Breton et al., 2007). In this regard, and in conjunction with digital solutionism (Morozov, 2013), a government may call itself open simply creating the right kind of website even if it does not become more transparent or accountable (Yu & Robinson, 2012). Thus, myriads of data have become available to the public in reusable digital forms and with an open license. Outsiders to the public administration have depend on them to build applications, visualizations or information. Because of the relative simplicity of its dissemination, it is fair that governments should not subtract this open data from the public. But this easiness might turn the disclosure into an end in itself, becoming an 'upload the spreadsheet' solution with no evaluation of the demand for the data or the value offered to society. At the same point, the myth of open data as 'raw data', which implicitly attributes absolute neutrality to its use, could bias the problem of accountability to an elite of users trained for its management and treatment, usually citizens from privileged backgrounds, with a high level of education, revenue or political interest (Santini & Carvalho, 2019).

With this motivation, we approach the research of the adoption and use of graphic tools for visualizing budgetary information. A picture is worth a thousand words, thereby these applications make budgets accessible, using proportional geometric figures to display global views and the weights of public policies. Users can breakdown policies and budget allocations while they get amounts budgeted or implemented and year-on-year evolution. By way of illustration, City of Madrid Open Budgets can be browsed at https://presupuestosabiertos.madrid.es/en/.

The investigation aims to improve knowledge about what leads adoption of this kind of software, who are the main users and what they use it for and how the software is framed in the general scheme of open data, transparency and accountability. To this end, this paper is presented in the following format. We first offer a joint background on governmental accountability and disclosure

of data, mainly as open data; thus, we build the case for using budget visualization tools. Second, we present our survey and explain data collection procedures. Third, we show the main results of the survey. Last section discusses the results and concludes with academic and practical implications.

## 2. Background

Following O'Donnell's classic model (1994), accountability can be set horizontally or vertically. The horizontal model refers to the conditions self-imposed by the government, mainly by some bodies over others. In a democratic society, it indirectly entails control and accountability to the public, but through experts and technical elements brought in that make the information and reporting distant and difficult to understand by ordinary citizens. The vertical model is in the strict sense the control and direct accountability by and to citizens, who would react with approval or disapproval of proposals and actions through the use of participatory channels of public debate, protest or support actions and ultimately in the electoral process. Vertical accountability can be enhanced encouraging domestic actors, especially the media and social organizations, to remain active and persistent on governmental issues; this way, the governmental responsibility as a whole is improved as horizontal accountability depends to a significant degree on the mechanisms of vertical (O'Donnell, 1998).

On a relevant effort to bring the disclosed information to citizens, many local and regional governments have turned in recent years to popular reporting, a kind of citizen-centric simplified document that may contain visual presentation formats and allows the citizen to understand and evaluate public management, thus reinforcing informative transparency and remarking the capacity of the public entities as agents generating economic value and wealth for society as a whole (Montesinos & Brusca, 2019). Despite being a proven reality in the United States and Canada (Yusuf et al., 2013) and a rising trend in Europe (Montesinos & Brusca, 2019), popular reporting should be connected with democratic participatory initiatives to be successful in achieving accountability and civic participation and collaboration (Manes-Rossi, 2019). Moreover, its format

should move from text documents or files that citizens may simply download, read, and discard, to civic software tools that empower citizenry to learn and actively participate through discussion and debating in public affairs (Aversano et al., 2019).

Nonetheless, beyond simplified formal reporting, the open data paradigm has gained momentum as a means of disseminating data not only useful for examination but also to re-use and building on it. Over the past two decades, the notions of transparency and accountability have merged with the concept of open government, drawing on language and foundations of the open source and open data movements along with the idea that Internet technologies could open doors for innovation, efficiency, and flexibility in government. In a network society scenario (Castells, 2010, 2013), information and communication technologies foster the effectiveness of networks in the political field related to hierarchical governmental structures, creating new two-way vertical channels of communication, hence allowing citizens to interact with and monitor public managers and governments and producing new possibilities for citizen participation in different democratic processes (Penteado et al., 2014).

Verticality does not exclude the use of intermediaries; however, it is increasingly conditioned by phenomena such as ‘fake news’ (Lazer et al., 2018) or ‘disinformation’ (Nielsen & Graves, 2017). Both have always been present in society, but digital means disseminate this type of information much more quickly and by more people than truthful information, notably when its subject is political in nature (Vosoughi et al., 2018) and to a greater extent on discussions focused on figures, such as the economic, financial and budgetary magnitudes of governments, because of the phenomenon known as ‘anchoring effect’ (Kahneman, 2012), a cognitive bias where an individual relies heavily on the first piece of information received, thus any subsequent judgement will be tightly conditioned. Pressure groups are skillful taking advantage of data and using availability heuristic (Kahneman et al., 1982) to achieve their own goals and the digital realm of transparency favors the ability of these groups to manipulate the data, increasing the risk of misinformation or misuse (Bannister & Connolly, 2011). The best approach to get the latter case is taking data out of

context (Huff, 1991; De Veaux & Hand, 2005). Thus, any figure publicly disclosed might have an excessive and negative effect on public debate, which may prevail if checking is hard to realize. Hence, in a world of abundance of data, disclosing data and information in an accessible and contextualized way becomes almost an obligation for governments to achieve the objectives of transparency and accountability.

Budgetary data were among the first to be freely and openly disclosed on the Internet, as simple data first on institutional websites and then on transparency portals (mostly PDF files containing the entire budgets), or later as reusable data in open data portals. Open budgetary data are datasets that are made accessible by public administrations in a structured machine-readable format to be freely used, redistributed and reused without restriction, to produce more complex information, visualizations or apps about the budget. As any other public information, it is disclosed under a strong normative undertone as a positive development that will lead to desirable outcomes (Bannister & Connolly, 2011), especially when accompanied by the publication of all budget documents that governments produce (De Renzio & Masud, 2011). However, this automatism is debatable since implementing accountability is far more complex than just disclosing raw data. Several authors pointed out that a well-educated society would be crucial for success in accountability, avoiding a 'data divide' that distinguish people according to their capabilities to generate outcomes from open data (Robinson, 2006; De Renzio & Krafchik, 2007; Kolstad & Wiig, 2009; Gurstein, 2011; Kasymova et al., 2016; Tygel et al., 2016) Thus, accountability based on open data should require improving literacy of users in the topic, and software tools that ease the access and understanding of the data. Nevertheless, in an environment of political pluralism with strong civil society and independent media, open budget data could also empower journalists working in public spending and finances (Dingwerth & Eichinger, 2010; Kasymova et al., 2016; Tygel et al., 2016). In both instances, open budget data can be seen as a mean to social and political goals rather than an end in itself (Gray, 2015). Either way, we should consider governments not only accountable for their use of public money but also for the provision of tools that will

encourage citizen participation (Aversano et al., 2019). Hence, any report, data or software that, directly or indirectly, enable citizenry to participate in public matters is advisable in order to achieve the desirable positive outcomes of public disclosure.

As researchers the authors have been focusing on the study of governmental information disclosure based on digital technology and open data for many years. In their experience, they agree with the diagnoses of:

- Heald (2012), in what he calls the problem of missing users in reference to the gap between expectations and actual use of publicly available information. Most of open data initiatives are founded on the promise of participation and collaboration between governments and citizens. However, when users are unknown the discourse of civic participation through online platforms creates a hazard of opportunistic rhetoric of governments (Santini & Carvalho, 2019). On this point, despite all the theoretical foundations that place citizens at the base of digital transparency and accountability (Brusca-Alijarde, 1997; Caba Pérez et al., 2005; Brusca & Montesinos, 2006), it is quite disputable that citizens have to be regarded as the main target of government disclosing, since they usually are far away from their governments and only a minority is seriously confronted with public data through mass and social media (Jones, 1992; van Helden & Reichard, 2019).
- Harrison et al. (2012), Meijer (2013) and Lourenço (2016) with regards to the relationship between transparency and accountability as a black box problem; apparently, there is a close relationship between the two concepts, but academic literature and case studies have not been able to provide a widespread assessment of the impacts of all programs, policies and technological tools produced around the world in pursuit of transparency and accountability.
- Gray (2015), who points there has been no analysis of the demand for budgetary information provided as open data and calls for the need to better understanding how these data is being used, by whom, to what end, and to what extent it is achieving its objectives. In the same

vein, Lourenço (2016) argues that aside from normative claims on open government initiatives, very few studies have been conducted to obtain evidence of any of the released data actually being used by their ultimate recipients or justification for the efforts being made in developing initiatives and software.

- Worthy (2015), who in personal interviews with officials, users and innovators related to budgetary and financial open data of the various governments in the United Kingdom shows how crucial would be to have accessible and simple software tools for users to locate and visualize information in its right context. His empirical result was in line with Bannister and Connolly (2011), who has previously pointed to explication and presentation as one of the major troubles with governmental transparency.
- Brandusescu et al. (2019), who expressed concerns about the complexity and general lack of assessment of open data governance, defined as *the interplay of rules, standards, tools, principles, processes and decisions that influence what government data is opened up, how and by whom*, an important emerging topic for the open data community that manifests itself when the release of data extend in volume and time.

All diagnoses lead in the same direction: despite disclosing information, it is not being used enough and its management might fall behind actual needs of users and governments. Moreover, it is unknown what features and tools cause positive effects and what the public exactly want, and even who the actual target public are; although there seems to be a demand for simple, accessible and contextualized information. The latter is what visualization tools for budget information on the web can offer. On the open data way is assumed that users have enough knowledge about public budgeting and software tools for raw data processing. On the contrary, an online visualization service help citizen to find, explore, understand and re-use data made available by governments. Thus, people can make sense of complex data and receive support when dealing with textual or

verbal information about budgetary matters, improving the understanding of the amounts allocated for different public policies and their progress over time.

## 3. Methodology

Research focus on the two main visualization tools in use in Spain. The first one is 'Aragón Open Budget'. The development was financed by the Aragón Open Data project and is the most widespread among Spanish public administrations. The application is licensed as free & open source software under European Union Public License 1.1, that grants freedom of use, reuse, adaptation and modification, with the sole condition of maintaining the resulting source code also as free software. Frequently, this application is also known as 'Where Do My Taxes Go' (hereafter referred to as DVMI, after Spanish original name '¿Dónde Van Mis Impuestos?'), the name used for the tool by the Civio Foundation who was its developer for the Aragon Open Data project and that codes most of the adaptations for Spanish public administrations, which can be found in its GitHub repository. This latter name is the one usually found on the institutional websites for the tool, combined with some others such as 'Clear Accounts' or 'Visual Budgets'. The determination of the population under study has focused on the software regardless of the name it receives from the governments, resulting in a total of 32 Spanish public administrations that in May 2019 had it in use on their institutional website and kept it up to date (see Annex I: 6 autonomous communities, 24 municipalities and 2 island councils). The coverage of DVMI is about 17 million inhabitants, just over a third of the Spanish population, who can use the application to visualize the budgets of their local and/or regional administrations.

The second tool is the budgeting viewer 'Where Does My Money Go?' (hereafter referred to as CMI, after Spanish original name 'Con Mis Impuestos'), developed by the Spanish company 'Idi Eikon' for its suite of open government services 'Governalia'. CMI is a privative software tool but with functional characteristics very similar to DVMI. Broadly, governments using CMI are mostly within the geographical scope of the Spanish Mediterranean coast and their size is significantly smaller than those on DVMI. The population under study comprises the 24 Spanish public

administrations that in May 2019 had CMI in use on their institutional website and kept it up to date (see Annex II: 2 provincial councils, 1 island council and 21 municipalities). The coverage of CMI is about 2.7 million inhabitants, a figure nearing 6% of the country population.

Research tool was a survey of 16 structured questions (see Annex III), comprising five-point Likert scales or multiple-choice questions and including open answer where appropriate. These questions were mainly constructed on the theoretical basis set out in the previous section but also in the principal theories of information technology adoption, whose discussion exceeds the scope of this article; for the reader interested in their characteristics and evolution we recommend the critical review of Tarhini et al. (2015). Questions were grouped into three blocks (general, individual attitudes and contexts) as a convenience to the respondent. Questionnaire was tested with experts in the field prior to being sent to the respondents in order to verify its relevance and functionality.

The survey was addressed to the individual in charge of the visualization tool, defined as the person with decision-making capacity about implementation, maintenance, updating or withdrawal of the application. During May 2019, the questionnaire was sent by email, providing a URL for the collection of data; this was followed up by a reminder and then a second reminder was sent by postal mail to those people for which no response had been obtained. The collection of responses ended days before the formation of the new governments arising from the local and regional elections May 26$^{th}$ 2019, thus avoiding potential interference by the arrival of new managers.

The response rates were 75% for DVMI group (24 out of 32; 6 regional governments and 18 municipalities) and 58.33% for CMI group (14 out of 24; 2 provincial councils, 1 island council and 11 municipalities). The different response rates are likely due to the difference in population size because CMI adoption is greater on smaller size municipalities. This thought is reinforced by the full response rate on autonomous communities, provincial councils and largest municipalities, both on DVMI and CMI groups.

For each Likert question, two sets of measures of central tendency and dispersion are provided. Arithmetic mean and standard deviation are commonly considered the descriptors that best

summarize a statistical distribution. However, the interpolated median and quartiles Q1i and Q3i should be preferred as representative of group responses since extreme answers could pull the mean and dispersion unrealistically (Young & Veldman, 1972; Kiess & Green, 2009). Calculations were performed using package psych v. 1.8.2 for R.

Results table for Likert scales questions is provided on Table 1 detailing IM, interpolated quartiles (Q1i & Q3i), mean and standard deviation for each question, and segregating global data from detailed data about DVMI and CMI installations. Results of non-Likert questions (percentages and dichotomous) are also provided on Table 2 and 3.

In the next section, the results obtained in the survey are analyzed according to the proposed goals.

## 4. Results

### *4.1 General block*

This section of the study outlines a number of generic characteristics relating to the disclosure of governmental data, particularly budgetary, and the barriers that may affect it.

**Importance of aspects on the disclosure of information**

To initiate the questionnaire, two questions were asked concerning the importance of three aspects in publishing information. The first on the importance given to them by the respondent and the second on the importance that the respondent believed their public administration attached to them, valuing from 1 to 5 from less to more important. For all three aspects the people in charge attached a greater importance to them than they believed the entity was giving them. There are no major differences between the three aspects, both for those valued by respondents and those attributed to the entity, but there is an expectations gap. The greatest gap is on disclosure as open data, which at the same time is the most highly valued aspect by managers and the least valued on credited to the public administrations. In no case abnormal deviations occurred, although these were greater in the responses on importance attributed by the entity; however, in the importance attached by managers to the disclosure as open data the standard deviation and interquartile range were rather small, indicating a high degree of consensus.

**Importance of contents**

The questionnaire inquired for the importance to the common citizen of some commonly disclosed data, on a 1 to 5 scale ranging from none to very important. The utmost significance was given to visual representations and to the disclosure of the line-item budget execution (in any format). The results also indicate a broad dismissal of the so-called access of open accounts, a practice in some Spanish public administrations that consists in disclosing the banking balances on a regular basis. Furthermore, the answers show that the low importance attached to the periodic publication of expenditure lists over EUR 500, a practice similar to the existing obligation for British municipalities since the beginning of their open data programmes. In no case abnormal dispersions were observed in the responses collected.

**User groups interested in the budgetary data**

The survey included a question intended to determine which groups were being targeted by the visualization tool. To this end, the managers were asked to value on a scale ranging from 1 to 5 the interest in budgetary data of the main user groups of governmental information. This is a paramount question for the research since this type of software aims to promote transparency and citizen engagement through the analysis and visualization of information. According to the results, individuals are clearly considered as the group least interested in budgetary information; on the contrary, political groups are by far the most regarded as interested, followed by the mass media. These results are consistent with the vertical concept of transparency and accountability, with political groups and media serving as intermediaries between citizenry and governments. However, it is harder to understand the extraordinary valuation that political parties receive, beyond the fact that budgetary data are their raw material in the discussions and deliberations at the public administration bodies. Deviations were very similar for all the assessed groups, except for political groups on CMI municipalities, where standard deviation and interquartile range are quite small.

**Barriers for adoption**

Last question of the general block was aimed to find out an assessment of different barriers to the adoption of the software, valuing from 1 to 5 whether the proposed barrier was none important or very important. In the answers is clearly shown that adopting the visualization tool was not a matter of money nor of technological capacity, but rather organizational. Overall, the higher rated was the cultural dynamics of the organization, understood as the usual procedures for getting things done, followed by the shortage of human resources (staff for the maintenance and updating), the lack of a clear strategy in transparency and accountability and even the hierarchical superiors. These four aspects can be part of the same problem: actions that are being put into effect to reinforce the positive image of transparency in the organization, without a proper planning to channel resources in a steady manner towards the achievement of well-defined objectives. It should be noted that deviations are higher than usual for each barrier, indicating a lower degree of consensus for the assessments.

### *4.2 Individual attitudes block*

This section provides answers to individual questions relating to the implementation and maintenance of the software.

**Beliefs about transparency type and previous working experience**

First, the research intends to know what the main objective of the tool is. In order to do this, respondents could only choose one of the available options. As the application under study is a budget visualization tool, it should come as no surprise that most respondents considered that improving financial and budgetary transparency is their main purpose, although this percentage is slightly larger on DVMI than on CMI. Nevertheless, the uses to support participatory processes (participatory transparency) and to locate specific data of special interest for the citizens (micro-transparency) get significant and similar percentages as primary purpose. However, the micro-transparency goal on CMI almost triples the answers for DVMI, this feature may arise from the smaller size of public administrations CMI, so their closeness to the citizens make them focus on the small data and no so much on the largest views. The remaining cases of use were commented by

the surveyed managers as illustrative use in press releases and awareness campaigns for taxpayers. It is clear that a tool cannot have a single purpose, but the answers show how an obvious objective may not be as clear as it seems a priori, turning up alternative targets since its inception. In particular, participatory transparency and micro-transparency, which can be considered as more sophisticated uses as they connect with the objectives of participation and collaboration typical of open government models, would be in line with the proactive approach of an innovative government.

Managers previous experience in implementing open data and/or other data visualization software was also inquired: and only about 40% of them responded in the affirmative, reporting responsibility for the development and maintenance of open portals or datasets, mainly in their current entity, a percentage faintly larger on CMI. Therefore, most of the people in charge had no previous experience in the field of opening public data.

**Perceived usefulness**

As is obvious, it is useful to know the insights of the managers about the outcomes obtained from the software. To this end, the survey provided a list of three actual uses with dichotomous response yes/no according to their knowledge. In addition, they were asked to explain any additional use or the absence of usefulness. The use of the application has been considered mainly beneficial for journalistic research. This use has broad consensus with more affirmative than negative responses. On the contrary, use in decision-making processes or to ask the administration or policy makers for explanations on public spending and government or management actions are denied by a higher percentage than affirmed. Both results are consistent with those previously obtained regarding users with the greatest interest in budgetary information, where the main group were the political parties followed by the media; and with the main objective of transparency, where participatory transparency and micro-transparency did not turn out to be the main purpose but obtained considerable response rates.

The remarkable result about user should be noted again, because on the open answers of the survey there are numerous comments to the limited use of the tool by the citizenry due to the lack of basic budgetary knowledge, and to the need to foster the software with informative campaigns about its existence, use, range of possibilities and contents to make a genuine impact on direct accountability to citizens. Therefore, it should not seem strange that most users came from groups mandated with representative tasks or curating data to prepare practical information for the general media. In addition, a fourth use arise from the open answers, the own use of the software on the public administration for internal reports about budgetary allocation or year-on-year comparisons, and on the generation of screenshots for informative campaigns on media about government actions. These uses are about as frequent as the journalistic information.

**Individual motivations**

This section describes the underlying reasons why the software is adopted according to the projection of individual motivations of managers in the behaviour attributed to of the public entity. To this end, they assessed three potential motivations from 1 (lesser importance) to 5 (greater importance). A dichotomous question (yes/no) related not to the organization but to the personal improvement in hierarchical position or influence after a successful implementation.

A broad agreement exists in the desire for excellence as the main motivation driver, and to a lesser extent in the intention of joining a group of innovative entities. The lowest score was for adoption as a response to social pressure to enhance accountability and transparency. Nonetheless, it should be noted that standard deviation of the answers shows that a clear consensus does not arise for the individual motivations; desire for excellence achieves a high degree of agreement just for DVMI and deviation shoots up when CMI installations are considered in the results.

Regarding professional carrier, just a 44.74% of the respondents think that a successful implementation could improve their position, but this percentage is 20 percentual points on CMI than on DVMI, maybe due to the comparative larger scale of the project in minor size public

administrations. Nonetheless, according to open answers, it should not be considered as a significant individual motivation driver.

### *4.3 Environmental block*

In this section, aspects related to the organizational and external environments are outlined.

**Ease of implementation, maintenance and access to the technology**

To assess this issue, answers both from individual attitudes block (Q9) and environmental block (Q11 and Q12) are used. It was considered convenient to group them in order to strengthen a joint understanding. In regard to the easiness of implementation and maintenance, it was assessed as intermediate (around 3 over 5, being 1 very easy and 5 very difficult), but slightly easier on DVMI installations than on CMI. In 80 per cent of cases, the public administrations contracted installations and launching with third parties. According to commentaries of the respondents, transferring data from the accounting management software to the visualization tool was the largest technical issue by reason of changes in budget allocations between working areas due to organizational restructuring. This results in a high use of human resources just to keep a correct allocation of budgetary data that may allow for year-on-year comparisons. Governance issues were also referred, probably as a matter of course of the absence of clear strategies in transparency. More specifically, a total lack of established procedures to determine who, how and when should fix the foregoing data transfer and undertake the disclosing and updating of data. It should be noted that prior and later stages to these issues (that are, the raw data collection and subsequent load of cleaned data) were cited as the lower technical difficulty steps.

Readiness of hardware and software was not considered as a significant barrier. In addition, software license model does not seem to have an effect on acceptance. Asked on dichotomous question (yes/no), that DVMI is free open source software was decisive in the choice just for 55% of managers, and that CMI is a commercial software was a key aspect for 50% of managers.

Managers were also surveyed for an appraisal of three aspects related to the access to the technology, from 1 (non-significant) to 5 (very significant). The respondents highlight the aspects

of expandability and potential for improvement of the tool and the ability to customization over the economic cost of acquisition and implementation. There was no meaningful difference in the assessment between the free and open DVMI and the commercial CMI; this might be a clear consequence of the low cost of ownership of both tools. However, the answering on economic cost has the lesser degree of agreement; overall, the lack of agreement is slightly greater for the tree aspects on DVMI than on CMI.

**Organizational environment, regulatory framework and proactiveness**

The aim was to know the effect of the organizational environment over acceptance of the software, as well as the impact of the external environment shaped by the regulatory framework and the degree of wilfulness and proactivity in governmental disclosure.

To this effect, managers were asked to assess from 1 (none important) to 5 (very important) a number of organizational features. Generally, size was considered the most important aspect although it also presents the highest scattering, especially on DVMI installations. On the contrary, external informal connections obtained the lowest score. But it should be noted that the difference in assessments was not wide-ranging, so caution is required when interpreting these results. Furthermore, it should bear in mind that the greater the size of the entity, the lesser the relative sacrifice of resources for a fixed cost of implementation. So, it is clear that the largest public entities enjoy an advantage over the smaller ones. Concerning budgetary resources, which had been previously set as non-significant barrier, its score should be considered as a positive aspect, in the way that both software are relatively cheap for most of the public administrations except for those of minor size.

More interesting were the answers regarding to the regulatory framework. In an environment where transparency is increasingly considered an issue linked to the public demand for regulations, the reasons of proactivity and voluntariness were overwhelmingly considered to be the most relevant for the adoption of the tool over any kind of regulatory framework that imposes disclosure obligations, reflecting the consensus achieve this response have one of the lowest deviations in the

survey for the DVMI managers, but not for the CMI ones, as well as the scores are slightly larger for DVMI than for CMI. It is obvious that compliance with the legal obligations of budgetary transparency can be satisfied by providing budgetary statements in a simple PDF document or even in open data, and that to implement this type of visualization software is to go further in a way that is not expressly covered in any statutory regulation.

**Leadership and monitoring**

As a key aspect of the acceptance of innovations, the type of leadership that drove the adoption of the tool should be explained. To this end, five types of leaderships were proposed, for which the respondents were asked to select one exclusively as the source of the initiative. According to the answers, the impetus was mainly political, followed at a great distance by a consensual decision between different roles. In very few cases the impulse came from an IT or budgetary officer and even less from civil servants without decision-making capacity. On CMI, the impetus is almost balanced between political leadership and general agreement; again, this is likely to be due to the smaller size of public administrations adopting CMI with much reduced organizational structures that facilitate consultations and general agreement.

Finally, it would be useful to know whether the use of the tool was being monitored after it was launched and become operational. To achieve this, respondents were asked to rate the use of the application from 1 to 5 (between very low and very high) and give a brief explanation about the rating given. Level of use was rated as average (around 3.4). Again, a widespread two-fold explanation emerges, pointing out the lack of a culture of access to public information that leads to its use just by small interest groups and the absence of dissemination and instruction on the tool by governments. In spite of these limited acceptance amongst citizenry, several voices remark the added value of the tool as a middle point between the challenge of open data for processing (structured text formats, CSV) and the poor versatility of PDF documents for the examination and analysis, thus they consider it to be a worthwhile investment.

## 5. Discussion and conclusions

Our results in the general block are in line with those obtained by Gray (2015) and Worthy (2015) for the United Kingdom, which described a low interest of the general public for open data, and the need to use intermediaries or to develop tools or interfaces that allow an easy access to data and help on contextualization. The research has mainly been inspired on the existence of this kind of tool for a specific set of data, not having found a clear consensus that it has aroused special interest among citizens, as Heald (2012) pointed out regarding effective transparency on public expenditure and the avoidance of what he called 'information brokers' (Heald, 2003). Accordingly, results also coincide in the non-existence of an average user, but rather of groups with very specific interests in particular information. In spite of this, the tool would fulfill its mission, creating simpler ways to access data that would otherwise require experts to obtain and contextualize it.

In accordance with Clark et al. (2015) this type of civic technology designed to be accountable to all citizens ends up in an activity dependent on small groups and, consequently, its use would be characterized by a certain instability as the needs of these groups come and go. It should not be identified with a lack of interest in data, but rather with the need for experts to remain in place in order to create and tell a story to the public on the basis of that data; for even though it is more accessible than in the pre-digital era or in the early years of online dissemination, it is still necessary for data to be obtained, contextualized, interpreted and channeled downstream to the laypeople in the matter. This implies an investment of time and resources that the citizen, the final recipient of accountability, cannot (and probably should not) face alone and for which he or she needs intermediaries, usually journalists, curators or other groups that perform the same function to funnel already processed information to the media. Therefore, the low number of users of these tools should not be counted as a failure, but simply as an indication that perhaps the focus and expectations have been placed on an inaccurate group of users, which could help explain the black box phenomenon exposed by Harrison (2012), Meijer (2013) and (2016). It is also remarkable the gap in expectations detected with respect to the importance of responding to the citizen demands for

information, the reusability of data, and a timely dissemination. Results describe that managers attach greater importance to these aspects than they believe their organizations attribute to them, which is consistent with what García-García & Curto-Rodríguez (2019) stated that many open data initiatives exist and are maintained thanks to the personal effort of specific people beyond any institutional program or strategy of transparency, participation or accountability. A second expectation gap is the previously referred between the theoretical target (citizens) and the mostly real users (media), which might result in pre-existing beliefs not being fulfilled and slowing down future spread of visual representation software in public accountability. This, together with the difficult matter of reconciling the changing budget structure to be incorporated to the software, and with the declared aspiration of seeking excellence for what might be discouraging an instrument that does not reach the general public, reinforces the feeling that there is a risk of jeopardizing the future of visualization tools.

In a positive sense, it is worth noting that among the variables of the environment there are no major organizational features that conclusively add or detract from the possibility of adoption. Furthermore, this is not dependent on budgetary or technological criteria, possibly due to the limited investment and operating costs and to the free software license of DVMI that also generates expectations about the possibility of future improvements or adaptations. Another outstanding feature in the organizational environment, which connects with the gap of expectations on the final users, is that the innovative leadership is mainly political. It is unknown to what extent the adoption of a civic technology can be a fashion-driven matter. Thus, policy makers may be replicating experiences that have been received a substantial media deal in other administrations, regardless any previous setting of objectives and assessment such as knowing the real users or achieving a specific type of transparency. Hence, the adoption of the tool would become a particular case of the *openwashing* phenomenon (Heimstädt, 2017). In any case, given the low cost of implementing these visualization tools and the relevance of the information offered, they are something that

should always exist, and that leads to question the reason for the small number of administrations that use them on their institutional website.

Finally, governance problems on the management layer, as defined by Brandusescu et al. (2019), appeared clearly reflected in most of the answers in reference to the issue of matching the changeable budgetary structure between years to allow for comparisons. Overall, there seems to be not clear procedure as to when it should be done, whether it should be part of the budgeting process itself, or by whom or how it should be done. It clearly points to a governance problem that in the long run may jeopardize the use of these tools or act as a barrier to expanding to new administrations; and it ultimately constitutes a hidden cost to be paid in terms of human resources time. As Abella et al. (2019) point out, manual manipulations or manipulations with non-specific software require repetitive tasks of little added value, which over time will be abandoned as the initial impulse decays. Hence, positive desires for proactivity and excellence should be focused on solving this governance problem. And that is why adopters of visualization tools should extend their transparency and accountability strategies to the operational management of this matter, and develop, if necessary, new routines, procedures or even software applications to cut or get rid of these hidden costs.

On the practical implications of the results for public managers, we advise them not to follow a blind implementation of the software since accountability do not appear out of the blue even using innovative tools. In our opinion, there are two key issues. Firstly, managers should bear in mind who the users will be and what uses the software will serve, rising above any preconceived ideas. Secondly, governance rules should be set at the planning stage in order to avoid any significant dysfunction in operations. This way, the public administration will gain a useful tool at the service of transparency. Additionally, for helping transparency become real accountability some kind of basic budgetary training with practical uses of the software should come along with the implementation.

As with any study, this research has several limitations. First, we surveyed managers for some questions that should have been asked to users; obviously, this would have resulted in a more ambitious research demanding more resources. Nonetheless, this way should shape the future of any research in disclosure of public data, which has put too much focus on supply side of data but not on the user demand side. Second, it would be interesting to know why governments do not use this software. We just survey those using it, and we do not think it implies a bias in our results since we focus on the perspective of the adoption, implementation and use once it has been decided. Nevertheless, we agree that it would be interesting to know about the causes discouraging adoption and should be part of future research.

**References**

Abella, A., Ortiz-de-Urbina-Criado, M., & De-Pablos-Heredero, C. (2019). The process of open data publication and reuse. *Journal of the Association for Information Science and Technology*, *70*(3), 296–300. https://doi.org/10.1002/asi.24116

Aversano, N., Tartaglia Polcini, P., Sannino, G., & Agliata, F. (2019). Integrated Popular Reporting as a Tool for Citizen Involvement in Financial Sustainability Decisions. In J. Caruana, I. Brusca, E. Caperchione, S. Cohen, & F. Manes Rossi (Eds.), *Financial Sustainability of Public Sector Entities: The Relevance of Accounting Frameworks* (pp. 185–205). Springer International Publishing. https://doi.org/10.1007/978-3-030-06037-4_10

Bannister, F., & Connolly, R. (2011). The Trouble with Transparency: A Critical Review of Openness in e-Government. *Policy & Internet*, *3*(1), 158–187. https://doi.org/10/ds6tkc

Brandusescu, A., Iglesias, C., Lämmerhirt, D., & Verhulst, S. (2019). *Open data governance and open governance: Interplay or disconnect?* World Wide Web Foundation. https://webfoundation.org/2019/02/open-data-governance-and-open-governance-interplay-or-disconnect/

Breton, A., Galeoitti, G., Salmon, P., & Winrobe, R. (2007). Introduction. In A. Breton, G.

Galeoitti, P. Salmon, & R. Winrobe (Eds.), *The Economics of Transparency in Politics*. Ashgate Press.

Brusca, I., & Montesinos, V. (2006). Are Citizens Significant Users of Government Financial Information? *Public Money & Management*, *26*(4), 205–209. https://doi.org/10.1111/j.1467-9302.2006.00526.x

Brusca-Alijarde, M. I. (1997). The Usefulness of Financial Reporting in Spanish Local Governments. *Financial Accountability and Management*, *13*(1), 17–34. https://doi.org/10.1111/1468-0408.00024

Caba Pérez, C., López Hernández, A. M., & Rodríguez Bolívar, M. P. (2005). Citizens' access to on-line governmental financial information: Practices in the European Union countries. *Government Information Quarterly*, *22*(2), 258–276. https://doi.org/10.1016/j.giq.2005.02.002

Castells, M. (2010). *The rise of the network society* (2nd ed.). Wiley-Blackwell.

Castells, M. (2013). *Communication power* (2nd edition). Oxford University Press.

Clark, B. Y., Zingale, N., Logan, J., & Brudney, J. (2015). *A Framework for Using Crowdsourcing in Government* (SSRN Scholarly Paper ID 1868283). Social Science Research Network. https://papers.ssrn.com/abstract=1868283

De Renzio, P., & Krafchik, W. (2007). *Lessons from the field: The impact of civil society budget analysis and advocacy in six countries*. International Budget Project.

De Renzio, P., & Masud, H. (2011). Measuring and Promoting Budget Transparency: The Open Budget Index as a Research and Advocacy Tool. *Governance*, *24*(3), 607–616. https://doi.org/10/brbwfx

De Veaux, R. D., & Hand, D. J. (2005). How to Lie with Bad Data. *Statistical Science*, *20*(3), 231–238. JSTOR.

Dingwerth, K., & Eichinger, M. (2010). Tamed Transparency: How Information Disclosure under the Global Reporting Initiative Fails to Empower. *Global Environmental Politics*, *10*(3), 74–96. https://doi.org/10.1162/GLEP_a_00015

García-García, J., & Curto-Rodríguez, R. (2019). El ejercicio de la rendición de cuentas mediante portales de datos abiertos en las comunidades autónomas españolas. *IDP. Revista de Internet, Derecho y Política*, *29*. https://doi.org/10.7238/idp.v0i29.3182

Gray, J. (2015). *Open Budget Data: Mapping the landscape*. Open Knowledge. http://www.fiscaltransparency.net/eng/resource_open_public.php?IdToOpen=20150902128

Gurstein, M. B. (2011). Open data: Empowering the empowered or effective data use for everyone? *First Monday*, *16*(2). https://doi.org/10.5210/fm.v16i2.3316

Harrison, T. M., Guerrero, S., Burke, G. B., Cook, M., Cresswell, A., Helbig, N., Hrdinova, J., & Pardo, T. (2012). Open government and e-government: Democratic challenges from a public value perspective. *Information Polity*, *17*(2), 83–97. https://doi.org/10.3233/IP-2012-0269

Heald, D. (2003). Fiscal Transparency: Concepts, Measurement and UK Practice. *Public Administration*, *81*(4), 723–759. https://doi.org/10.1111/j.0033-3298.2003.00369.x

Heald, D. (2012). Why is transparency about public expenditure so elusive? *International Review of Administrative Sciences*, *78*(1), 30–49. https://doi.org/10/gcx5x2

Heimstädt, M. (2017). Openwashing: A decoupling perspective on organizational transparency. *Technological Forecasting and Social Change*, *125*, 77–86. https://doi.org/10.1016/j.techfore.2017.03.037

Huff, D. (1991). *How to lie with statistics*. Penguin.

Jones, R. (1992). The development of conceptual frameworks of accounting for the public sector. *Financial Accountability and Management*, *8*(4), 249–264. https://doi.org/10.1111/j.1468-0408.1992.tb00442.x

Kahneman, D. (2012). *Thinking, fast and slow*. Penguin Books.

Kahneman, D., Slovic, P., & Tversky, A. (Eds.). (1982). *Judgment under uncertainty: Heuristics and biases*. Cambridge University Press.

Kasymova, J., Ferreira, M. A. M., & Piotrowski, S. J. (2016). Do Open Data Initiatives Promote and Sustain Transparency? A Comparative Analysis of Open Budget Portals in Developing

Countries. In J. Zhang, L. F. Luna-Reyes, T. A. Pardo, & D. S. Sayogo (Eds.), *Information, Models, and Sustainability* (Vol. 20, pp. 137–155). Springer International Publishing. https://doi.org/10.1007/978-3-319-25439-5_7

Kiess, H. O., & Green, B. A. (2009). *Statistical Concepts for the Behavioral Sciences* (4th ed.). Pearson.

Kolstad, I., & Wiig, A. (2009). Is Transparency the Key to Reducing Corruption in Resource-Rich Countries? *World Development*, *37*(3), 521–532. https://doi.org/10.1016/j.worlddev.2008.07.002

Lazer, D. M. J., Baum, M. A., Benkler, Y., Berinsky, A. J., Greenhill, K. M., Menczer, F., Metzger, M. J., Nyhan, B., Pennycook, G., Rothschild, D., Schudson, M., Sloman, S. A., Sunstein, C. R., Thorson, E. A., Watts, D. J., & Zittrain, J. L. (2018). The science of fake news. *Science*, *359*(6380), 1094–1096. https://doi.org/10.1126/science.aao2998

Lourenço, R. P. (2016). Evidence of an Open Government Data Portal Impact on the Public Sphere: *International Journal of Electronic Government Research*, *12*(3), 21–36. https://doi.org/10.4018/IJEGR.2016070102

Manes-Rossi, F. (2019). New development: Alternative reporting formats: a panacea for accountability dilemmas? *Public Money & Management*, *39*(7), 528–531. https://doi.org/10.1080/09540962.2019.1578540

Meijer, A. (2013). Understanding the Complex Dynamics of Transparency. *Public Administration Review*, *73*(3), 429–439. https://doi.org/10/f4xbkv

Montesinos, V., & Brusca, I. (2019). Non-financial reporting in the public sector: Alternatives, trends and opportunities: *Revista de Contabilidad - Spanish Accounting Review*, *22*(2), 122–128. https://doi.org/10.6018/rcsar.383071

Morozov, E. (2013). *To save everything, click here: Technology, solutionism, and the urge to fix problems that don't exist*. Penguin UK.

Nielsen, R. K., & Graves, L. (2017). *News you don't believe: Audience perspectives on fake news*. Reuters Institute for the Study of Journalism.

https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2017-10/Nielsen&Graves_factsheet_1710v3_FINAL_download.pdf

O'Donnell, G. A. (1994). Delegative Democracy. *Journal of Democracy*, *5*(1), 55–69. https://doi.org/10.1353/jod.1994.0010

O'Donnell, G. A. (1998). Horizontal Accountability in New Democracies. *Journal of Democracy*, *9*(3), 112–126. https://doi.org/10.1353/jod.1998.0051

Penteado, C. L. D. C., Santos, M. B. P., & Araújo, R. D. P. A. (2014). Democracia, Sociedade Civil Organizada e internet: Estratégias de articulação online da Rede Nossa São Paulo. *Sociologias*, *16*(36), 206–235. https://doi.org/10.1590/15174522-016003613

Robinson, M. (2006). *Budget analysis and policy advocacy: The role of non-governmental public action* (No. 279; Working Paper Series). Institute of Development Studies. https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/4043

Santini, R. M., & Carvalho, H. (2019). The rise of participatory despotism: A systematic review of online platforms for political engagement. *Journal of Information, Communication and Ethics in Society*. https://doi.org/10.1108/JICES-02-2019-0016

Tarhini, A., Arachchilage, N. A. G., Masa'deh, R., & Abbasi, M. S. (2015). A Critical Review of Theories and Models of Technology Adoption and Acceptance in Information System Research: *International Journal of Technology Diffusion*, *6*(4), 58–77. https://doi.org/10.4018/IJTD.2015100104

Tygel, A. F., Attard, J., Orlandi, F., Campos, M. L. M., & Auer, S. (2016). 'How Much?' is not Enough: An Analysis of Open Budget Initiatives. *Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance*, 276–286. https://doi.org/10.1145/2910019.2910054

van Helden, J., & Reichard, C. (2019). Making sense of the users of public sector accounting information and their needs. *Journal of Public Budgeting, Accounting & Financial Management*, *31*(4), 478–495. https://doi.org/10.1108/JPBAFM-10-2018-0124

Vosoughi, S., Roy, D., & Aral, S. (2018). The spread of true and false news online. *Science*, *359*(6380), 1146–1151. https://doi.org/10.1126/science.aap9559

Worthy, B. (2015). The Impact of Open Data in the UK: Complex, Unpredictable, and Political. *Public Administration*, *93*(3), 788–805. https://doi.org/10/f7rr53

Young, R. K., & Veldman, D. J. (1972). *Introductory statistics for the behavioral sciences*. Holt, Rinehart and Winston.

Yu, H., & Robinson, D. G. (2012). The New Ambiguity of "Open Government". *UCLA Law Review*, *59*, 178–208.

Yusuf, J.-E., Jordan, M. M., Neill, K. A., & Hackbart, M. (2013). For the People: Popular Financial Reporting Practices of Local Governments: For the People: Popular Financial Reporting. *Public Budgeting & Finance*, *33*(1), 95–113. https://doi.org/10.1111/j.1540-5850.2013.12003.x

Table 1: Responses table (Likert scales)

| | **GLOBAL** | | | | | **DVMI** | | | | | **CMI** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** |
| Q1 – Response to citizen demand | 3.75 | **4.71** | 5.10 | **4.37** | 0.94 | 4.00 | **4.75** | 5.13 | **4.46** | 0.88 | 3.33 | **4.63** | 5.06 | **4.21** | 1.05 |
| Q1 – Disclosure as open data for reuse | 4.13 | **4.71** | 5.10 | **4.58** | 0.60 | 4.25 | **4.75** | 5.13 | **4.67** | 0.48 | 3.88 | **4.63** | 5.06 | **4.43** | 0.76 |
| Q1 – Disclosure in the minimum time period | 3.63 | **4.42** | 4.97 | **4.24** | 0.85 | 3.70 | **4.64** | 5.07 | **4.33** | 0.92 | 3.50 | **4.07** | 4.63 | **4.07** | 0.73 |
| Q2 – Response to citizen demand | 3.00 | **4.00** | 4.91 | **3.92** | 1.05 | 3.07 | **4.25** | 4.95 | **4.00** | 1.06 | 2.92 | **3.50** | 4.80 | **3.79** | 1.05 |
| Q2 – Disclosure as open data for reuse | 2.89 | **3.90** | 4.77 | **3.74** | 1.20 | 2.75 | **3.93** | 4.75 | **3.71** | 1.19 | 3.00 | **3.83** | 4.80 | **3.79** | 1.23 |
| Q2 – Disclosure in minimum time period | 3.05 | **3.88** | 4.64 | **3.79** | 1.04 | 3.00 | **3.70** | 4.50 | **3.83** | 1.13 | 3.00 | **3.70** | 4.50 | **3.71** | 0.91 |
| Q3 – Line-item budget | 3.29 | **4.07** | 4.77 | **3.95** | 0.98 | 3.50 | **4.17** | 4.83 | **4.08** | 1.13 | 2.50 | **3.90** | 4.63 | **3.71** | 1.14 |
| Q3 – Line-item budget execution | 3.62 | **4.35** | 4.94 | **4.18** | 0.90 | 3.77 | **4.32** | 4.90 | **4.29** | 0.69 | 3.00 | **4.50** | 5.00 | **4.00** | 1.18 |
| Q3 – Visualizations | 3.88 | **4.60** | 5.05 | **4.34** | 0.91 | 3.94 | **4.58** | 5.04 | **4.38** | 0.88 | 3.50 | **4.63** | 5.06 | **4.29** | 0.99 |
| Q3 – Payments over 500 EUR | 2.91 | **3.71** | 4.39 | **3.61** | 1.08 | 3.10 | **3.86** | 4.41 | **3.67** | 1.13 | 2.75 | **3.33** | 4.50 | **3.50** | 1.02 |
| Q3 – Open access to banking balance | 1.96 | **2.67** | 3.50 | **2.82** | 1.11 | 1.83 | **2.50** | 3.17 | **2.54** | 0.98 | 2.20 | **3.17** | 4.50 | **3.29** | 1.20 |
| Q3 – Electronic procurement data | 3.61 | **4.29** | 4.91 | **4.11** | 0.98 | 3.68 | **4.23** | 4.83 | **4.13** | 0.90 | 3.25 | **4.50** | 5.00 | **4.07** | 1.14 |
| Q4 – Private citizens | 2.27 | **3.50** | 4.29 | **3.34** | 1.17 | 2.70 | **3.72** | 4.39 | **3.58** | 1.06 | 1.92 | **2.50** | 4.00 | **2.93** | 1.27 |
| Q4 – Media | 3.22 | **4.04** | 4.77 | **3.95** | 0.96 | 3.10 | **4.07** | 4.83 | **3.92** | 1.06 | 3.38 | **4.00** | 4.63 | **4.00** | 0.78 |
| Q4 – Contractors | 3.04 | **3.83** | 4.64 | **3.82** | 0.95 | 2.93 | **3.79** | 4.64 | **3.75** | 1.03 | 3.20 | **3.90** | 4.63 | **3.93** | 0.83 |
| Q4 – Citizens' associations | 3.04 | **3.80** | 4.71 | **3.82** | 1.01 | 3.21 | **3.94** | 4.64 | **3.88** | 0.99 | 2.86 | **3.36** | 4.80 | **3.71** | 1.07 |
| Q4 – Political groups | 4.05 | **4.71** | 5.10 | **4.45** | 0.92 | 3.83 | **4.64** | 5.07 | **4.29** | 1.08 | 4.38 | **4.80** | 5.15 | **4.71** | 0.47 |
| Q5 – Hierarchical superiors | 2.44 | **3.93** | 4.87 | **3.66** | 1.34 | 2.30 | **3.70** | 4.75 | **3.50** | 1.38 | 2.50 | **4.50** | 5.00 | **3.93** | 1.27 |
| Q5 – ICT resources | 2.33 | **3.39** | 4.27 | **3.32** | 1.19 | 2.07 | **3.10** | 4.17 | **3.13** | 1.26 | 2.88 | **3.70** | 4.50 | **3.64** | 1.01 |
| Q5 – Human resources | 3.00 | **4.06** | 4.87 | **3.89** | 1.09 | 3.17 | **4.00** | 4.75 | **3.92** | 0.97 | 2.50 | **4.50** | 5.00 | **3.86** | 1.29 |
| Q5 – Cultural dynamics | 3.59 | **4.19** | 4.82 | **4.03** | 1.03 | 3.50 | **4.10** | 4.75 | **3.88** | 1.15 | 3.75 | **4.33** | 4.92 | **4.29** | 0.73 |
| Q5 – Lack of a clear strategy | 3.04 | **3.90** | 4.77 | **3.87** | 0.99 | 3.00 | **3.83** | 4.75 | **3.50** | 1.01 | 3.13 | **4.00** | 4.80 | **3.93** | 1.00 |
| Q5 – Budgetary resources | 1.97 | **2.64** | 4.08 | **3.00** | 1.25 | 1.90 | **2.50** | 3.83 | **2.88** | 1.26 | 2.08 | **3.00** | 4.50 | **3.21** | 1.25 |
| | **GLOBAL** | | | | | **DVMI** | | | | | **CMI** | | | | |
| | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** |
| Q9A – Perceived easiness | 2.04 | **3.07** | 4.00 | **3.03** | 1.15 | 2.13 | **3.25** | 4.13 | **3.17** | 1.17 | 1.88 | **2.83** | 3.80 | **2.79** | 1.12 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q10A – Desire for excellence | 4.31 | **4.80** | 5.15 | **4.61** | 0.72 | 4.60 | **4.90** | 5.20 | **4.83** | 0.38 | 3.50 | **4.50** | 5.00 | **4.21** | 0.97 |
| Q10A – Join a group of innovative entities | 2.82 | **3.68** | 4.55 | **3.63** | 1.10 | 2.88 | **3.64** | 4.50 | **3.67** | 1.01 | 2.50 | **3.75** | 4.63 | **3.57** | 1.28 |
| Q10A – Response to social pressure | 2.00 | **2.92** | 4.13 | **3.03** | 1.33 | 1.75 | **2.88** | 4.00 | **2.92** | 1.41 | 2.20 | **3.00** | 4.50 | **3.21** | 1.19 |
| | **GLOBAL** | | | | | **DVMI** | | | | | **CMI** | | | | |
| | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** | **Q1i** | **IM** | **Q3i** | **Mean** | **SD** |
| Q11 – Technological capability | 1.45 | **2.32** | 3.75 | **2.61** | 1.39 | 1.61 | **2.28** | 3.50 | **2.50** | 1.18 | 1.20 | **2.50** | 4.63 | **2.79** | 1.72 |
| Q12B – Economic cost | 2.44 | **3.59** | 4.50 | **3.45** | 1.22 | 2.17 | **3.50** | 4.50 | **3.33** | 1.34 | 2.88 | **3.70** | 4.50 | **3.64** | 1.01 |
| Q12B – Ability to customize | 3.19 | **4.00** | 4.71 | **3.89** | 0.98 | 3.17 | **4.21** | 4.90 | **3.96** | 1.12 | 3.20 | **3.79** | 4.29 | **3.79** | 0.70 |
| Q12B – Expandability and potential for improvement | 3.33 | **4.03** | 4.71 | **3.97** | 0.88 | 3.30 | **4.06** | 4.75 | **3.96** | 0.95 | 3.38 | **4.00** | 4.63 | **4.00** | 0.78 |
| Q13 – Size of the entity | 2.81 | **3.83** | 4.64 | **3.63** | 1.24 | 2.83 | **3.94** | 4.64 | **3.46** | 1.27 | 2.80 | **3.50** | 4.63 | **3.57** | 1.22 |
| Q13 – Decentralization in decision-making | 2.21 | **2.96** | 3.81 | **3.05** | 1.04 | 2.17 | **2.83** | 3.50 | **2.92** | 0.88 | 2.33 | **3.25** | 4.50 | **3.29** | 1.27 |
| Q13 – Organizational and hierarchical formalizations | 2.64 | **3.50** | 4.29 | **3.42** | 1.13 | 2.64 | **3.50** | 4.25 | **3.42** | 1.10 | 2.50 | **3.50** | 4.50 | **3.43** | 1.22 |
| Q13 – Internal informal connections | 2.50 | **3.33** | 4.50 | **3.42** | 1.15 | 2.33 | **3.13** | 4.10 | **3.21** | 1.14 | 2.88 | **3.83** | 4.80 | **3.79** | 1.12 |
| Q13 – External informal connections | 1.96 | **2.68** | 3.60 | **2.87** | 1.17 | 2.38 | **3.10** | 4.50 | **2.63** | 1.13 | 2.38 | **3.10** | 4.50 | **3.29** | 1.14 |
| Q13 – Human resources | 2.77 | **3.50** | 4.36 | **3.53** | 1.06 | 2.75 | **3.50** | 4.25 | **3.46** | 1.06 | 2.80 | **3.50** | 4.63 | **3.64** | 1.08 |
| Q13 – Budgetary resources | 2.50 | **3.41** | 4.35 | **3.42** | 1.13 | 2.50 | **3.70** | 4.30 | **3.46** | 1.14 | 2.50 | **3.07** | 4.63 | **3.36** | 1.15 |
| Q14 – Regulatory framework | 2.00 | **3.00** | 4.11 | **3.05** | 1.27 | 2.00 | **2.90** | 3.88 | **2.92** | 1.10 | 2.00 | **3.17** | 4.80 | **3.29** | 1.54 |
| Q14 – Wilfulness and proactivity | 4.18 | **4.74** | 5.12 | **4.58** | 0.68 | 4.50 | **4.83** | 5.17 | **4.75** | 1.27 | 3.80 | **4.50** | 5.00 | **4.29** | 0.91 |
| Q16 – Monitoring | 2.50 | **3.41** | 4.27 | **3.39** | 1.10 | 2.50 | **3.50** | 4.17 | **3.38** | 1.01 | 2.50 | **3.30** | 4.63 | **3.43** | 1.28 |

Table 2: Responses table (Percentages)

| **Q6 – Types of transparency** | **GLOBAL** | **DVMI** | **CMI** |
|---|---|---|---|
| Budgetary and financial | 52.63% | 58.33% | 42.86% |
| Participative | 21.05% | 20.83% | 21.43% |
| Micro | 21.05% | 12.50% | 35.71% |
| Other | 5.26% | 8.33% | 0.00% |
| **Q9 – Implementation** | **GLOBAL** | **DVMI** | **CMI** |
| Procurement with third parties | 81.58% | 79.17% | 85.71% |
| Ownself installation | 18.42% | 20.83% | 14.29% |
| Voluntary activities | 0.00% | 0.00% | 0.00% |
| **Q15 – Leadership** | **GLOBAL** | **DVMI** | **CMI** |
| Political leadership | 55.26% | 62.50% | 42.86% |
| Budgetary officer | 5.26% | 8.33% | 0.00% |
| IT officer | 10.53% | 8.33% | 14.29% |
| Civil servant | 0.00% | 0.00% | 0.00% |
| General agreement | 26.32% | 20.83% | 41.67% |

Table 3: Responses table (Dichotomous questions)

| | **GLOBAL** | | **DVMI** | | **CMI** | |
|---|---|---|---|---|---|---|
| | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** |
| Q7 – Previous experience | 42.11% | 57.89% | 37.50% | 62.50% | 50.00% | 50.00% |
| Q8A – Accountability on spending and government action | 47.37% | 53.63% | 50.00% | 50.00% | 42.86% | 57.14% |
| Q8A – Participation in decision-making processes | 36.84% | 63.16% | 33.33% | 66.67% | 42.86% | 57.14% |
| Q8A – Journalistic information | 60.53% | 39.47% | 62.50% | 37.50% | 57.14% | 42.86% |
| Q8C – Internal use | 57.89% | 42.11% | 54.17% | 45.83% | 64.29% | 35.71% |
| Q10B – Improvement of position or influence | 44.74% | 55.26% | 37.50% | 62.50% | 57.14% | 42.86% |
| Q12A – Software license decisive in adoption | 52.63% | 47.37% | 54.17% | 45.83% | 50.00% | 50.00% |

# Annexes for online publication only

**Annex I: DVMI installations – May 2019**

| **Autonomous Communities (regional governments)** | |
|---|---|
| Aragón | https://presupuesto.aragon.es/ |
| Castilla – La Mancha | https://castillalamancha.dondevanmisimpuestos.es/ |
| Euskadi | http://aurrekontuak.irekia.euskadi.eus/ |
| Islas Baleares | https://pressupostsillesbalears.cat/ |
| Murcia | https://presupuestos.carm.es/ |
| Navarra | http://presupuesto.navarra.es/ |
| **Municipalities** | |
| A Coruña | http://ondevanosmeusimpostos.coruna.gal/ |
| Alhama de Murcia | https://alhama.dondevanmisimpuestos.es/ |
| Arona | https://arona.dondevanmisimpuestos.es/ |
| Arroyomolinos | https://misimpuestos.ayto-arroyomolinos.org/ |
| Barcelona | http://ajuntament.barcelona.cat/estrategiaifinances/pressupostobert/ |
| Castelló de la Plana | https://onvanelsmeusimpostos.castello.es/ |
| Cheste | https://cheste.dondevanmisimpuestos.es/ |
| Eibar | https://dondevanmisimpuestos.eibar.eus/ |
| El Prat de Llobregat | https://onvanelsmeusimpostos.elprat.cat |
| Las Palmas de Gran Canaria | https://laspalmasgc.dondevanmisimpuestos.es/ |
| Madrid | https://presupuestosabiertos.madrid.es/ |
| Málaga | http://lascuentasclaras.malaga.eu/ |
| Maó | https://mao.dondevanmisimpuestos.es/ |
| Montmeló | https://onvanelsmeusimpostos.montmelo.cat/ |
| Moralzarzal | https://moralzarzal.dondevanmisimpuestos.es/ |
| Pinto | https://pinto.dondevanmisimpuestos.es/ |
| Polinyà | https://pressupostos.ajpolinya.cat/ |
| Santa Coloma de Gramenet | https://gramenet.dondevanmisimpuestos.es |
| Santiago | https://orzamentoaberto.santiagodecompostela.gal/ |
| Silla | https://silla.dondevanmisimpuestos.es |
| Torrelodones | https://presupuestos.torrelodones.es/ |
| Vall d'Uixó | https://lavallduixo.dondevanmisimpuestos.es/ |
| Valladolid | http://cuentasclaras.valladolid.es/ |
| Vilanova i la Geltrú | http://pressupostos.vilanova.cat/ |
| **Island Councils** | |
| Eivissa | https://eivissa.dondevanmisimpuestos.es/ |
| Menorca | https://menorca.dondevanmisimpuestos.es/ |

# Annexes for online publication only

**Annex II: CMI installations – May 2019**

| **Provincial councils** | |
|---|---|
| Castelló | https://datoseconomicos.dipcas.es/ |
| Murcia | https://carm.governalia.es/ |
| **Municipalities** | |
| Albal | https://albal.conmisimpuestos.com/ |
| Alboraya | https://alboraya.conmisimpuestos.com/ |
| Calviá | https://calvia.conmisimpuestos.com/ |
| Cartagena | https://cartagena.conmisimpuestos.com/ |
| Catadau | https://catadau.conmisimpuestos.com/ |
| Gavá | http://pressupost.gavaciutat.cat/ |
| L'Eliana | https://leliana.conmisimpuestos.com/ |
| La Oliva | https://laoliva.conmisimpuestos.com/ |
| La Pobla de Vallbona | https://lapobladevallbona.conmisimpuestos.com/ |
| Molina de Segura | https://molinadesegura.conmisimpuestos.com/ |
| Museros | https://museros.conmisimpuestos.com/ |
| Onda | https://pressupost.onda.es |
| Onil | https://onil.conmisimpuestos.com/ |
| Orihuela | https://orihuela.conmisimpuestos.com/ |
| Pego | https://pego.conmisimpuestos.com/ |
| Picassent | https://picassent.conmisimpuestos.com/ |
| Quart de Poblet | https://quartdepoblet.conmisimpuestos.com/ |
| Rota | https://rota.conmisimpuestos.com/ |
| San Cristobal de La Laguna | https://lalaguna.conmisimpuestos.com/ |
| Torrent | https://torrent.conmisimpuestos.com/ |
| Vinarós | https://vinaros.conmisimpuestos.com/ |
| **Island Councils** | |
| El Hierro | https://elhierro.conmisimpuestos.com/ |

# Annexes for online publication only

**Annex III: Survey (translation from original in Spanish)**

***General block***

**Q1. Subjective importance.** Evaluate from 1 to 5 the importance that YOU attach to the following aspects on disclosing data (1= not important; 5= very important)

- Respond to citizen demand
- Disclosure as open data for reuse
- Disclosure in the minimum time period

**Q2. Importance for the government.** Evaluate from 1 to 5 the importance that YOUR ENTITY attaches to the following aspects on disclosing data (1= not important; 5= very important)

- Respond to citizen demand
- Disclosure as open data for reuse
- Disclosure in the minimum time period

**Q3. Contents.** What type of transparency information is of most interest to the average citizen? Evaluate from 1 to 5 (1 = not important; 5= very important):

- Line-item budget (in any format: PDF, CSV, XLS, etc.)
- Line-item budget execution (in any format: PDF, CSV, XLS, etc.).
- Budgetary visualizations.
- Individual spending data over 500 euros (in any format: PDF, CSV, XLS, etc.).
- Open access to banking balance.
- Electronic procurement data (data stored in National State Administration platform or own platform).

**Q4. Users.** Which groups are the most interested in budgetary data? Evaluate from 1 to 5 (1= not interested; 5= very interested):

- Public
- Media
- Contractors
- Citizens' associations
- Political groups
- Other (please specify)

**Q5. Barriers.** Are any of the following barriers to the acceptance of the visualization tool? Evaluate from 1 to 5 (1 = not important; 5= very important):

- Resistance from hierarchical superiors
- ICT resources (hardware or software)
- Human resources (availability of people to work on project)
- Cultural dynamics (existing ways of doing things)
- Lack of a clear strategy in transparency and accountability
- Budgetary resources

***Individual attitudes block***

**Q6. Previous beliefs.** What type of transparency will the tool create? (Mark only one option):

- Budgetary and financial transparency
- Participation transparency (encouraging people to be more politically involved)
- Micro-transparency (allowing the public to find out small pieces of local information of importance to them)
- Other (please specify):

**Q7. Previous experience.**

A) Before implementation of the tool, have you ever collaborated in the implementation of any type of open datasets or visualization tools in your entity or in any other? Please, answer YES/NO.

B) Could you detail the type of open data work (full portal, particular datasets, etc.) or visualization tool, and if it was on your current entity or any other?

**Q8. Perceived usefulness.**

A) Do you know if the tool has been used in any of the following situations? Please, answer YES/NO

- Accountability on spending and government action.
- Participation in decision-making processes.
- Journalistic information.
- Other (please specify)

B) Please, give details or examples of the known uses, or explain why you think they have not happened.

C) Do you know any use of the tool within your entity by political or administrative people? Please, answer YES/NO

D) If the previous answer is affirmative, what kind of data was searched and for which purpose?

**Q9. Perceived easiness in the implementation.**

A) Evaluate from 1 to 5 the level of difficulty of the implementation and maintenance of the tool for your entity (1= very easy; 5= very difficult).

B) In your opinion, which was the larger technical difficulty (not economic) in implementing the tool?

C) And the lesser one?

D) The implementation of the tool was mainly achieved by (mark only one option):

- Own means
- Procurement arrangements with third parties
- Voluntary activities

**Q10. Individual motivations.**

A) Evaluate from 1 to 5 the relevance of the following aspects in deciding the adoption of the tool (1= not important; 5= very important):

- Desire for excellence in transparency and accountability
- Desire of joining a group of innovative entities
- Response to social pressure for transparency and accountability

B) Within your entity, do you believe a successful implementation of the tool could improve the hierarchical position or influence of the person in charge?

***Environmental block***

**Q11. Technological capability.** Has hardware or software availability been a significant barrier in the tool implementation? Evaluate from 1 to 5 (1= not significant; 5= very significant).

**Q12. Access to technology**

A) Has availability as free open source software been decisive in the choice of the tool? Please, answer YES/NO *(question in DVMI survey)* // Has availability as commercial software been decisive in the choice of the tool? Please, answer YES/NO *(question in CMI survey)*

B) Evaluate from 1 to 5 the importance of the following aspects in the adoption of the tool (1= not important; 5= very important):

- Economic cost
- Ability to customize

- Expandability and potential for improvement

**Q13. Organizational environment.** Evaluate from 1 to 5 the importance of the following organizational aspects in the adoption of the tool (1= not important; 5= very important):

- Size of the entity (autonomous community, municipality, council, etc.)
- Decentralization in decision-making
- Clear organizational and hierarchical formalizations
- Internal informal connections (within your entity)
- External informal connections (with outsiders)
- Human resources
- Budgetary resources

**Q14. Regulatory framework.** In order to implement the tool, which one of the following have been more determinant? Evaluate from 1 to 5 (1= not determinant; 5= very determinant):

- Regulatory framework (e.g. transparency and good governance act)
- Wilfulness and proactivity

**Q15. Leadership.** In your opinion, the impetus to the adoption of the tool mainly arise from (mark only one option):

- Political leadership (president, mayor, councillor, etc.)
- Budgetary officer
- IT officer
- Civil servant without decision-making power
- General agreement among various of the above-mentioned

**Q16. Monitoring.** How do you appraise the use of the visualization tool? Evaluate from 1 to 5 (1= very low; 5= very high). If you wish, you may explain your appraisal in the blank space.