Environmental management

The influence of civic mindedness, trustworthiness, usefulness, and ease of use on the use of government websites

Influência da inclinação cívica, confiabilidade, utilidade e facilidade de uso sobre o uso de websites governamentais

La influencia de la inclinación cívica, la confiabilidad, la utilidad y la facilidad de uso en el uso de los sitios web gubernamentales

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Abstract

Civic mindedness and the perceptions of trustworthiness, usefulness, and ease of use seem to explain much of the effective use of websites. This article discusses the extent to which such factors influence the use of government websites based on a study with 210 citizens who were doing their biometric electoral registration in João Pessoa – a major city in Brazil. With the help of ordinary least squares and quantile regression models, we found that there is mixed influence of those factors on the use of government websites. On average, perceived usefulness and perceived ease of use had a significant influence; but for low levels of use, only perceived usefulness had an influence, whereas perceived ease of use had an influence for moderate and high levels of use. In terms of trustworthiness, only the dimension about trust in government had an influence for all levels of use. In terms of civic mindedness, only the dimension about civic engagement had an influence, except for moderate levels of use. Our results reinforce that the development of government websites should focus on the citizens' individual profiles and levels of use, that is, focus should be directed to the demand side (users) besides merely addressing the legal requirements and the provision of services by the supplier (government).

Resumo

Inclinação cívica e as percepções de confiabilidade, utilidade e facilidade de uso parecem explicar o uso efetivo de sítios web. Este artigo discute o grau em que tais fatores influenciam o uso de sítios web governamentais a partir de um estudo com 210 cidadãos que se encontravam em processo de registro eleitoral biométrico na cidade de João Pessoa, Brasil. Com apoio do método dos mínimos quadrados ordinários (OLS) e modelos quantílicos de regressão, descobriu-se que há influência mista daqueles fatores sobre o uso de sítios web governamentais. Em média, utilidade percebida e facilidade de uso percebida apresentaram influência significativa; contudo, em níveis baixos de uso, apenas utilidade percebida apresentou influência, enquanto facilidade de uso percebida apresentou influência em níveis moderados e altos de uso. Em termos de confiabilidade, apenas sua dimensão de confiança no governo apresentou influência em todos os níveis de uso. Em termos de inclinação cívica, apenas sua dimensão

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de engajamento cívico apresentou influência, com exceção em níveis moderados de uso. Os resultados reforçam que o desenvolvimento de sítios web governamentais deve focar nos perfis individuais e nos níveis de uso dos cidadãos; ou seja, o foco deve ser também direcionado ao lado da demanda (usuários), em vez de apenas aos requisitos legais e ao fornecimento de serviços por parte do ofertante (governo).

Palavras-chave: Governo eletrônico; Uso de sítios web; Inclinação cívica; Confiabilidade; Utilidade percebida; Facilidade de uso percebida

Resumen

Inclinación cívica y las percepciones de confiabilidad, utilidad y facilidad de uso parecen explicar gran parte del uso efectivo de los sitios web. En este artículo se analiza el grado en que estos factores influyen en el uso de los sitios web del gobierno sobre la base de un estudio con 210 ciudadanos que estaban haciendo su registro electoral biométrico en João Pessoa - una grande ciudad en Brasil. Con la ayuda de modelos de regresión (mínimos cuadrados ordinarios y por cuantiles), se encontró que existe influencia mixta de esos factores en el uso de los sitios web gubernamentales. En promedio, la utilidad percibida y la facilidad de uso percibida tuvieron una influencia significativa; pero para los bajos niveles de utilización, solamente la utilidad percibida tuvo una influencia, mientras que la facilidad de uso percibida tuvo una influencia para niveles moderados y altos de uso. En términos de confiabilidad, sólo la dimensión de la confianza en el gobierno tuvo una influencia para todos los niveles de uso. En términos de civismo, sólo la dimensión sobre participación cívica tuvo una influencia, a excepción de niveles moderados de uso. Nuestros resultados refuerzan que el desarrollo de sitios web del gobierno debe centrarse en los perfiles individuales de los ciudadanos y en los niveles de uso, es decir, el foco debe estar dirigido hacia el lado de la demanda (usuarios), además de simplemente hacer frente a los requerimientos legales y la prestación de servicios por el proveedor (gobierno).

Palabras clave: Gobierno electrónico; Uso de sitios web; Inclinación cívica; Confiabilidad; Utilidad percibida; Facilidad de uso percibida

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Introduction

Electronic government (e-gov) has been considered a tool to transform the relationship between public administration and society. This is partly due to the potential that Internet applications have, along with the typically poor use of technology that public administrators do (Streib & Navarro, 2006). The perspectives that are based on the supply side or the relationship between government and society, and the relative lack of studies on the demand side or the interaction between the citizens and their governments also contribute to such a reality (Damian & Merlo, 2013; Rana, Dwivedi, & Williams, 2013b; Reddick, 2005). Nevertheless, e-gov has the potential to span all government functions and activities that are shaped by the use of information and communication technologies (ICTs) (Brown, 2005), so that a reciprocal relationship between the ICTs and the social, political and organizational factors may influence the success of e-gov (Helbig, Gil-García, & Ferro, 2009).

According to a citizen-centered perspective, a myriad of factors influence the use of e-gov services and tools. For instance, technology acceptance model's (TAM) perceived usefulness and perceived ease of use are particularly appropriate for the study of citizen-oriented e-gov (Rana, Dwivedi, & Williams, 2013a). Nevertheless, those constructs should not be studied in isolation in the domain of information systems adoption (Benbasat & Barki, 2007; Lee, Kozar, & Larsen, 2003). In the particular domain of e-gov, psychological and social factors should be included (Carter, 2008; Rana et al., 2011, 2013a,b), such as trustworthiness (Avgerou, Ganzaroli, Poulymenakou, & Reinhard, 2009; Bannister & Connolly, 2011; Belanche, Casaló, & Flavián, 2012; Carter & Bélanger, 2005; Carter & Weerakkody, 2008; Lim et al., 2011; Morgeson, Vanamburg, & Mithas, 2011;

Schaupp & Carter, 2010; Smith, 2011; Srivastava & Teo, 2009; Weerakkody et al., 2013; Welch, 2004) and civic mindedness (Dimitrova & Chen, 2006; Farina et al., 2013; Kang & Gearhart, 2010). Other constructs that are popular in technology adoption research, such as computer self-efficacy, social influence and the mediating factors are not enough to explain the intention to use and the effective use of e-gov (Carter, 2008; Costa, de Oliveira, Dandolini, de Souza, 2014; Rana et al., 2011, 2013a,b), so they are not addressed in this article.

The Brazilian literature has studies about citizens and e-gov use (*e.g.*, Damian & Merlo, 2013; De Araujo, 2013; De Abreu & De Pinho, 2014), but it seems that they are limited in data type and scope. For instance, De Abreu and De Pinho (2014) and Damian and Merlo (2013) use observation-based data to analyze government websites in terms of the available services and the participation of people in digital democracy processes, whereas De Araujo (2013) makes use of secondary data, that is, a dataset that is out of the researcher's control.

Both in the international and the Brazilian literatures, the research models are usually designed to predict the intention of use or the effective use of a particular instance of e-gov, such as for information, transaction, or interaction. They do not use to provide a broad view of the possibilities that stem from e-gov. Besides, they do not address the different levels of e-gov use, that is, the models usually rely on estimates about the average use of a certain instance of e-gov. Our study suggests that there may be variations in the influence of social or psychological factors according to the level of use that is in focus (such as low, moderate, or high). As an example, perceptions about the usefulness of government websites may vary according to individual use profiles. It follows that there is a need to develop e-gov tools that match the expected levels of use and the individual use profiles.

Our article seeks to answer the following research question: To which degree do civic mindedness, trustworthiness, usefulness, and ease of use influence the use of government websites? Toward that, we selected websites that are both an instrument for information and services, but also for the collective participation of citizens and government alike in public interests (Sandoval-Almazan & Gil-Garcia, 2012). The article is organized as follows: first, we discuss the theoretical background according to a demand view of e-gov, and also according to the perspective of an individual's digital limitations; second, we discuss the empirical method, with a particular emphasis on the measures and procedures for data collection and analysis; third, we discuss the results on the basis of descriptive measures, the psychometric consistency of the constructs of interest, the ordinary least squares (OLS) and quantile regression models, and the differences that we found based on the regression models; and fourth, we conclude by reflecting that the development of e-gov tools should focus on the citizens' individual profiles and levels of use, thus addressing the demand side (user) in addition to the legal requirements and the mere provision of services by the supplier (government).

Theoretical background

Studies on e-gov may be classified according to a supply view – whose focus is on what is offered by the public administration – or a demand view – whose focus is on the interaction between the citizens and the public administration (Reddick, 2005). The digital divide debate has much to contribute to the demand view, given its interest on the user and a multi-perspective approach (Helbig, Gil-García, & Ferro, 2009). We here follow the perspective of digital limitations (Bellini, Giebelen, & Casali, 2010; Bellini, Isoni Filho, Garcia, & Pereira, 2012) or digital effectiveness (Bellini, Isoni Filho, De Moura, & Pereira, 2016) in order to frame the user of e-gov tools according to his/her cognitive capabilities and limitations that account for the digital skills needed for him/her to make effective use of the ICTs.

In order to appraise one's cognitive limitations in regard to e-gov, we adopt a set of proxy measures described in the literature about the demand for e-gov, such as when technology adoption models are applied to measuring the intention to use or the effective use of e-gov by individuals (*e.g.*, Rana et al., 2011, 2013a). We also select for this study a specific set of constructs that seem to have an influence over the use of e-gov tools: civic mindedness, and the perceptions of trustworthiness, usefulness, and ease of use. These constructs have been used to explain e-gov use (Carter, 2008; Dimitrova & Chen, 2006; Kang & Gearhart, 2010; Rana et al., 2013a) and they address some aspects related to the cognitive digital limitations.

Perceived usefulness and perceived ease of use are the widely known constructs of TAM (Davis, 1989). Besides being popular in information systems research in general, TAM has been widely used in e-gov as well (Lee et al., 2003; Rana et al., 2013a). Although TAM was developed to describe compulsory use of information systems, its uses in other contexts are widely reported (Lee et al., 2003).

Perceived usefulness, or the degree to which a user believes that using a given system would improve his/her work performance, is the most significant factor of technology adoption (Benbasat & Barki, 2007). Research on the intention to use or the effective use of e-gov have consistently found this factor as significant to explain the adoption of e-gov tools (*e.g.*, Carter, 2008; Carter & Bélanger, 2005; Carter & Weerakkody, 2008; Dimitrova & Chen, 2006; Hung, Chang, & Yu, 2006; Rana et al., 2013a). On the other hand, perceived ease of use, or the degree to which a user believes that using a given system would be free of effort, is also reported in some studies as an important factor for e-gov adoption (Carter & Bélanger, 2005; Hung et al., 2006; Kolsaker & Lee-Kelley, 2008). In fact, a systematic literature review by Rana et al. (2013b) about the models deployed in citizen-focused e-gov research confirmed the perceptions of usefulness and ease of use as factors for the adoption of e-gov. This leads to our fist two hypohteses:

H1. Perceived usefulness has a positive influence on the use of government websites.

H2. Perceived ease of use has a positive influence on the use of government websites.

Beliefs related to trust are key for the enactment of trustworthiness in government websites (Belanche et al., 2012; Carter & Bélanger, 2005; Carter & Weerakkody, 2008; Schaupp & Carter, 2010; Srivastava & Teo, 2009; Teo, Srivastava, & Jiang, 2008; Weerakkody et al., 2013). Trustworthiness is defined as a citizen's trust in his/her government's competence to make Internet services available (Carter & Bélanger, 2005; Lee & Turban, 2001; Lim et al., 2011; Srivastava & Teo, 2009; Weerakkody et al., 2013), that is, it is trust in the service's agent and the technology (Carter & Bélanger, 2005; Carter & Weerakkody, 2008; Srivastava & Teo, 2009).

In terms of trust in government, the relationship between the government and the citizens plays a prominent role in the formation of trust in government's websites (Teo et al., 2008). This means that the use of e-gov tools is dependent on the individuals' perception that their government has the needed competence to develop and assure the security of e-gov systems (Carter & Weerakkody, 2008; Carter et al., 2011; Lim et al., 2011; Srivastava & Teo, 2009; Weerakkody et al., 2013). Transparent and reliable electronic interactions with the government are likely to increase trust and acceptance of e-gov services; but frauds, corruption and unfulfilled promises are likely to decrease trust and increase resistance toward e-gov (Carter & Weerakkody, 2008; Lim et al., 2011).

In terms of trust in the Internet, it is heavily dependent on the perception of security (Carter & Bélanger, 2005; Teo et al., 2008). This means that if the citizen does not believe that the Internet is safe for him/her to make exchanges with the government, he/she will be afraid of frauds and will be reluctant to provide personal data. On the other hand, the higher the confidence on Internet transactions, the higher the belief that online interactions and transactions with the government can be successful (Srivastava & Teo, 2009; Teo et al., 2008). This leads to our third hypohtesis:

H3. Perceived trustworthiness has a positive influence on the use of government websites.

H3a. Trust in the government has a positive influence on the use of government websites.

H3b. Trust in the Internet has a positive influence on the use of government websites.

Civic mindedness broadly refers to adhering to the civic duties as a way to realize socially desirable values (Kam et al., 1999), and it also refers to the individual attitude toward sacrificing time and effort in order to provide public interest services (Hechter, Kim, & Baer, 2005). Civic mindedness may include the support to democratic processes, a representative government, and the existence of and participation in electoral polls (Kam et al., 1999); social contact, previous interest in government, and the use of media for the debate of public interests (Dimitrova & Chen, 2006); and judging one's character, participating in community services, as well as an individual and collective sense of obligation toward the community (Hechter et al., 2005; Kang & Gearhart, 2010). In our study, civic mindedness has three dimensions: civic engagement, civic values, and democracy and citizenship.

Through the use of websites, public administration may motivate citizens to amplify their community engagement and participation (Farina et al., 2013). When citizens use the electronic means to interact with government, they mimic the community routines that take place in more traditional channels (Dimitrova & Chen, 2006). For instance, the use of direct democracy services and resources in government websites such as policy meetings, online consultation, virtual meeting, discussion forums, and voting relates to civic engagement and political behavior such as participating in political campaigns, public hearings, petition drives, and protests (Kang & Gearhart, 2010); and the act of voting by the eldest relates to civic mindedness, since such an action is assumed to be related to the perception of civic duty (Kam et al., 1999). Also, individuals who have higher civic mindedness are more likely to use e-gov services (Dimitrova & Chen, 2006). This leads to our fourth hypohtesis:

H4. Civic mindedness has a positive influence on the use of government websites.

H4a. Civic engagement has a positive influence on the use of government websites.

H4b. Democracy and citizenship have a positive influence on the use of government websites.

H4c. Civic values have a positive influence on the use of government websites.

Method

Our empirical study was a psychometric survey that collected answers from respondents by means of an 11-point Likert-like agreement scale. The answers were submitted to regression analysis, whose dependent and independent variables are given in Table 1: the use of government websites (dependent variable), perceived usefulness, perceived ease of use, trustworthiness, and civic mindedness (independent variables). Usefulness and ease of use were measured with a single statement each, since it seems that both are unidimensional (Rossiter & Braithwaite, 2013). Trustworthiness and civic mindedness were measured with several statements. The dependent variable (the use of government websites) was measured as the arithmetic mean of three items.

All items in Table 1 were adapted from the literature. The items were validated in terms of meaning and clarity in two meetings of the authors' research team, which includes researchers from the fields of management, production engineering, computer science, information science, and education. Experts in political science and public administration also contributed. The instrument was provided in print to the researchers at the meetings, and they assessed each item according to a five-point scale from "totally inadequate" ("1") to "totally adequate" ("5") and also according to a five-point scale from "very unclear" ("1") to "very clear" ("5"). The items were thoroughly discussed in group and adapted to the Brazilian reality and to the technology of our interest – government websites.

Another methodological step was to design the questionnaire in terms of its general layout and the sequence of items. This was also done in another meeting of the research team. Demographic variables were added (gender, income, age, and education) and a pre-test was scheduled. The pre-test was done with 30 individuals in December 2013 and January 2014, with data being analyzed in another meeting of the research team.

The validated questionnaire was applied to the field in the city of João Pessoa, which is the capital of Paraíba, a state in Northeastern Brazil. This city was selected for several reasons: (1) it is the city where the researchers work, so the analysis of data would be enhanced by the researchers' knowledge about the regional idiosyncrasies; (2) João Pessoa had about 791,000 inhabitants at the time of the survey (IBGE, 2015b), being among the largest cities and metropolitan areas in Northeastern Brazil; (3) in terms of Municipal Human Development Index (IDHM), which takes into account longevity (long and healthy life), education (access to knowledge) and income (standard of living), João Pessoa is classified as high human development, ranked as the fourth in Northeast and 320th among the 5565 Brazilian municipalities (Atlas Brasil, 2015; PNUD, 2015).

Non-probability sampling was applied to collect the data directly at select biometric electoral registration offices in the city. The decision was based on the likelihood that those offices would be a gathering place for all demographic strata of electors at that time, biometric registration was in process for a limited time and it was mandatory for all electors between 18 and 70 years of age.[1] Data collection was carried out by two of the authors during one week of January 2014 in different periods of the day and in different locations of biometric registration. The researchers approached the electors face to face and asked them to answer voluntarily the questionnaire, with no mediation

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[1] In Brazil, voting is optional from 16 to 18 and after 70 years of age.

Table 1
Dependent and independent variables.

Dependent variables Values: from "totally disagree" ("0") to "totally agree" ("10")	
Type of use	**Items**
Information (UINFO)	1. I frequently use government websites to obtain information (*e.g.*, about public agencies, transportation, safety, leisure, polls, *etc.*).
Services (USERV)	1. I frequently use government websites for services (*e.g.*, pay taxes or fees, obtain or renew licenses, *etc.*).
Interaction (UINT)	1. I frequently use government websites to interact with the government (*e.g.*, participate in discussions about public policies, voting, meetings, interaction with government representatives, *etc.*).
General use (USO)	Arithmetic mean of the three items above.
Independent variables Values: from "totally disagree" ("0") to "totally agree" ("10")	
Construct	**Items**
Perceived usefulness (PU)	1. Comparing to other websites, government websites are useful.
Perceived ease of use (PEOU)	1. Comparing to other websites, government websites are easy to use.
Trust in the Internet (CINT)	1. The Internet is secure enough for me to feel comfortable to use it in interactions with the government.
	2. I am sure that the legal and technological resources are enough to protect me against problems in the Internet.
	3. In general, the Internet is a solid and secure environment for me to transact with the government.
Trust in government (CGOV)	1. I feel that I can trust in government websites.
	2. I trust in government websites to make secure electronic transactions.
	3. In my opinion, government websites are reliable.
	4. I trust in government websites to keep in mind my best interests.
Civic mindedness (IC)	1. Every citizen should be concerned about the public interests.
	2. Every citizen should cast his/her vote in all polls.
	3. Voting is valid, because it is a way to express opinions about the public interests.
	4. Everybody has the same rights, regardless of the political beliefs.
	5. Everybody should have the right to express freely, regardless of opinions.
	6. Voting in a political representative helps to improve the community.
	7. When the community's interests are threatened, everybody needs to oppose.
	8. I read newspapers in order to learn about the government or get information about the public interests.
	9. I have been already in touch with a representative from the government in order to solve an issue of the community where I live.
	10. I feel like a member of the community where I live.
	11. I propose ideas to improve the community where I live.
	12. I take part of activities to improve the community where I live.
	13. I work with other people in order to improve the community where I live.
	14. I feel the need to help to improve my community.

Source: Adapted from Carter and Bélanger (2005), Davis (1989), Dimitrova and Chen (2006), Haller, Li, and Mossberger (2011), Hechter et al. (2005), Kam et al. (1999), Kang and Gearhart (2010), Rossiter and Braithwaite (2013).

of public employees that were in charge of the biometric registration, so that no external influence occurred in selecting the respondents.

The non-probability aspect of our data collection is justified by the intention to approach people who voluntarily rushed to the biometric registration offices – what the researchers interpreted as a higher regard to the voting process and the correspondingly expected attitude toward citizenship. However, from a certain moment on, the sample was mostly formed by young people (below 24 years of age), so the researchers started to look for older people to participate in the survey. Less literate adults constituted the biggest challenge in data collection, since the questions demanded some level of abstract thinking, online experience, and an adequate understanding of what was being asked. At this point, we need to remark that Brazil suffers from astonishingly increasing rates of illiteracy, and the Northeast is the poorest and less educated region in the country.

Results

Data analysis consisted of four steps: preliminary exploratory assessment, descriptive statistics of the sample, psychometric consistency assessment of the scales, and multivariate data analysis (estimation of OLS and quantile regression models). Data analysis was supported by MS-Excel 2010, SPSS 18, and R 2.15.3.

Preliminary exploratory analysis

The initial dataset was composed of 270 cases. The first exploratory procedure was the screening of the dataset in search of duplicate responses (two or more repeated cases), cases in which a single question had more than one answer, and cases where the response pattern did not match the expected variance. This led to the exclusion of 18 cases and a sample of 252 cases.

Table 2
Sample.

Variable	Possible answers	n	%
Gender	Male	92	43.8
	Female	118	56.2
Age	From 16 to 24 years of age	95	45.2
	From 25 to 34 years of age	53	25.2
	From 35 to 44 years of age	30	14.3
	More than 44 years of age	32	15.2
Education	Elementary or middle school	31	14.8
	High school	104	49.5
	University or college	75	35.7
Income[a]	Up to R$700.00 (about one minimum wage)	38	18.1
	From R$700.01 to R$1400.00 (about 1–2 minimum wages)	58	27.6
	From R$1400.01 to R$2100.00 (about 2–3 minimum wages)	34	16.2
	From R$2100.01 to R$3500.00 (about 3–5 minimum wages)	30	14.3
	From R$3500.01 to R$7000.00 (about 5–10 minimum wages)	30	14.3
	More than R$7000.00 (about 10 minimum wages)	20	9.5

[a] The reference was the minimum wage of R$724.00 per month as of 2014.

In the second exploratory procedure, we excluded 13 cases with missing values in variables measured by a single item; for the categorical variables of gender, income, age, and education, we excluded nine cases with missing values; and for constructs with more than one dimension, we excluded six cases with duplicate or missing values in two or more items of the same dimension. We also analyzed missing values by item and by case, taking into account the reference of 10% or more (Hair, Black, Babin, Anderson, & Tatham, 2005). No additional case was excluded following that reference. The final dataset was composed of 224 cases, with the remaining missing values being replaced by the average of the corresponding item (variable).

The third exploratory procedure was the analysis of atypical cases represented by the statistical outliers. We started with the standard z-scores for civic mindedness, trustworthiness, usefulness, ease of use, and the dependent variable. Given the sample size, univariate outliers were those whose absolute values were 4 or greater (Hair et al., 2005). Three cases were excluded for not meeting that reference, thus reducing the sample to 221 cases. Additionally, we analyzed leverage and influential points for the OLS regression model, what resulted in 11 new exclusions for their impact on the model fit – and a final set of 210 cases.

Sample

Our sample is mentioned in Table 2 according to gender, age, education, and income. There is predominance of females (56.2%), people between 16 and 24 years of age (45.2%), high school as the educational background (49.5%), and income of up to two minimum wages (27.6%). Data from the national census (IBGE, 2015a) show that women predominate both in Brazil (51%) and in the city of João Pessoa (53.3%). Also, the age pyramid is becoming larger in the middle both in Brazil and in João Pessoa (Atlas Brasil, 2015; IBGE, 2015a). In terms of education, as of 2010, 49.91% of the population in João Pessoa over 25 years of age had a high school degree, with 50.75% among all Brazilians (Atlas Brasil, 2015). And in terms of income, the average domestic monthly income in João Pessoa was R$3263.64 as of 2010 (IBGE, 2015b) or R$964.82 per capita (Atlas Brasil, 2015), that is, almost two minimum wages at that time (the minimum wage was R$510.00 per month). Although the leading numbers in each demographic variable are similar for our sample, the Brazilian population and the population of João Pessoa, other numbers do not correspond perfectly. Anyway, we should remember that our sample refers to voters, not to the full population.

Psychometric consistency of scales

For trustworthiness and civic mindedness, the extracted variance in each of their dimensions should be at least 50%, and the scores should be at least 0.5 during exploratory factor analysis. As for the internal consistency estimate of reliability, Cronbach's alpha should be at least 0.6. Both references were met (Table 3), so that the dimensions are reliable to measure the latent constructs. The remaining constructs (perceived usefulness, and perceived ease of use) are univariate.

Descriptive measures of constructs

For all constructs, the items were measured from 0 to 10. Table 4 gives the descriptive measures, including the dependent variable.

The mean and the median for trustworthiness suggest that this construct reached a low and moderate level. Trust in the Internet had lower values for measures of position than trust in government, and the measures of dispersion suggest that there is moderate convergence of the position of respondents around the mean. Such results may indicate unsatisfactory experiences with the public institutions and the political environment, with effects on the perception about the government's ability to offer electronic services. Besides, remembering that in 2013 and 2014 the polemic electronic espionage by the US government on several countries was made public, this may have contributed to the perception of people about trust in the Internet; and the trust in

Table 3
Trustworthiness and civic mindedness.

Dimension	Items (#)	Extracted variance (%)	Minimum score	Alpha
Trust in the Internet	3	73.594	0.835	0.819
Trust in government	4	76.882	0.848	0.899
Civic engagement	5	69.462	0.755	0.889
Civic values	3	62.960	0.768	0.695
Democracy and citizenship	3	66.705	0.782	0.743

Table 4
Descriptive measures.

Dimension or construct	Mean	Median	Quartile		Standard deviation	Skewness	Kurtosis
			1	3			
Independent variables							
Trust in the Internet	3.78	3.67	2.00	5.33	2.16	0.343	−0.250
Trust in government	4.29	4.25	2.75	5.75	2.32	0.171	−0.557
Civic engagement	5.17	5.20	3.35	7.25	2.59	−0.211	−0.917
Civic values	8.98	9.50	8.33	10.0	1.35	−1.648	2.421
Democracy and citizenship	7.08	7.67	5.67	9.00	2.51	−0.923	0.097
Perceived usefulness	4.72	5.00	2.75	7.00	2.74	−0.065	−1.022
Perceived ease of use	4.54	5.00	2.00	7.00	2.73	0.055	−1.018
Dependent variable (use of government websites)							
Aggregate measure[a]	3.84	3.67	2.00	5.67	2.25	0.387	−0.444
Information	5.14	5.00	3.00	8.00	2.80	−0.139	−0.955
Services	3.53	3.00	1.00	6.00	2.98	0.458	−0.974
Interaction	2.88	2.00	0.00	5.00	2.77	0.804	−0.292

[a] Arithmetic mean of the three dimensions.

government may reflect the fact that Brazilians trust the private institutions more than the public ones (Almeida, 2007).

The mean and the median for civic mindedness suggest that this construct reached a moderate level for civic engagement, a moderate-high level for democracy and citizenship, and a high level for civic values. Civic engagement had the lowest values for the measures of position, maybe due to the lethargy of the Brazilian society (De Pinho, 2011). The measures of dispersion suggest that there is moderate convergence of the position of respondents around the mean. And mean and median values for civic values suggest that our respondents may have focused on what is mostly expected from them by society.

The mean and the median for ease of use and for usefulness suggest that these constructs reached a moderate level. The measures of dispersion suggest that there is moderate convergence of the position of respondents around the mean. This suggests that it is necessary to improve the contents, the services and the interactive tools in government websites. E-gov improvements are in fact needed in many instances of public administration for the sake of better communications, information availability, transparency, democracy, and participation (De Pinho, 2008).

For the dependent variable, the arithmetic mean of the three measures suggests that the use of government websites reached a low-moderate level. The use of websites for information had the highest values for the measures of position, followed by services and interaction. The measures of dispersion suggest that there is moderate convergence of the position of respondents around the mean. For the dependent variable, the results were

similar to the Brazilian reality; in fact, according to Centro de Estudos sobre as Tecnologias da Informação e da Comunicação (CETIC.br, 2013), most e-gov in Brazil refers to information search services, such as consulting the situation of individuals, searching for directions on how to issue documents, searching for information on the legislation of work, and searching for public education. This is followed by services such as income declaration, tax and fee payments, and registering for public sector employment opportunities. Finally, people use e-gov to interact with government in group forums, chat rooms, and polls. The low perception of e-gov as an opportunity to interact may result from certain aspects of the Brazilian society, which prefers more traditional participation channels (CETIC.br, 2013).

Regression analysis

Initially, we applied OLS with stepwise (backward) method. The dependent variable was the arithmetic mean of the three measures (information, services, and interaction) for the use of government websites. Table 5 shows the variables that were significant to explain the dependent variable. The F-test suggests the model's fit ($p < 0.001$), explaining 38.27% of the total variance of the dependent variable (adjusted R^2). Lilliefors, Breusch–Pagan and Durbin–Watson tests applied to the residuals suggest the model's fit in terms of normality, homocedasticity, and error independence, respectively.

The results suggest that hypothesis H1 about the positive influence of perceived usefulness on the use of government websites was not rejected ($p < 0.01$); that is, controlling for other

Table 5
OLS linear regression model for the use of government websites.

Independent variable	β	Confidence interval (lower|upper bound)	t	p-value
Intercept	0.3074	−0.3957|1.0106	0.8620	0.3896
Trust in government	0.2453	0.1267|0.3639	4.078	6.49e−05
Civic engagement	0.1602	0.0619|0.2584	3.215	0.00152
Perceived ease of use	0.1754	0.0543|0.2965	2.856	0.00473
Perceived usefulness	0.1830	0.0634|0.3025	3.017	0.00288

Regression diagnostic			
F-test (4 and 205 df)	33.4 ($p < 0.001$)	Lilliefors test for normality (p-value)	0.0449 (0.3801)
R^2	0.3945	Breusch–Pagan (7 df) (p-value)	8.9741 (0.2545)
Adjusted R^2	0.3827	Durbin–Watson (p-value)	2.0743 (0.606)

Table 6
Quantile regression model for the use of government websites.

Independent variable	Dependent variable (quartiles)		
	0.25 β (p-value)	0.50 β (p-value)	0.75 β (p-value)
Intercept	−1.2356 (0.0602)[a]	0.4220 (0.4580)	1.1210 (0.0238)[b]
Trust in government	0.3183 (0.0021)[c]	0.2492 (0.0146)[b]	0.2363 (0.0132)[b]
Civic engagement	0.2476 (0.0038)[c]	0.0744 (0.3718)	0.1519 (0.0526)[a]
Perceived ease of use	0.0736 (0.4103)	0.2955 (0.0089)[c]	0.3067 (0.0124)[b]
Perceived usefulness	0.1673 (0.0613)[a]	0.1424 (0.1657)	0.1684 (0.1503)
Pseudo R^2	0.1777	0.2264	0.2841

[a] $p < 0.1$
[b] $p < 0.05$
[c] $p < 0.01$

factors, higher levels of perception of usefulness are associated with higher levels of use of government websites. Hypothesis H2 about the positive influence of perceived ease of use on the use of government websites was not rejected as well ($p < 0.01$); that is, controlling for other factors, higher levels of perception of ease of use are associated with higher levels of use of government websites. Hypotheses H3 and H4 were partially rejected. Hypothesis H3a about the positive influence of trust in government on the use of government websites was not rejected ($p < 0.001$); that is, controlling for other factors, higher levels of perception of trust in government are associated with higher levels of use of government websites. And Hypothesis H4a about the positive influence of civic engagement on the use of government websites was not rejected ($p < 0.01$); that is, controlling for other factors, higher levels of civic engagement are associated with higher levels of use of government websites.

In order to assess the degree to which the independent variables of the OLS model influence the levels of use of government websites, we developed a quantile regression model (Table 6). In general, quantile estimators are more efficient than estimators from the OLS method (Buchinsky, 1998; Yu, Lu, & Stander, 2003). The median, for instance, is more meaningful than the mean to estimate the middle point of a population in the presence of outliers. We decided to assess the quartiles of the dependent variable as follows: low level of use (first quartile), moderate

level of use (second quartile), and high level of use (third quartile).

As for Hypothesis H1, the results suggest that perceived usefulness had a significant and positive influence on the use of government websites only in the first quartile (low levels of use, $p < 0.1$). This result should be taken with care, given that the estimators (β) and the significance level suggest that the extent of influence of perceived usefulness on the use of government websites was low.

As for Hypothesis H2, the results suggest that perceived ease of use had a significant and positive influence on the use of government websites in the median (second quartile) and in the third quartile (moderate and high levels of use, $p < 0.01$ and $p < 0.05$). From the estimators (β), we may conclude that the extent of influence of perceived ease of use was marginally larger in the third quartile than the second.

As for hypothesis H3a, the results suggest that trust in government had a significant and positive influence on the use of government websites in the three levels ($p < 0.01$ and $p < 0.05$). From the estimators (β), we may conclude that the extent of influence of trust in government was larger in the first quartile than in the other two.

And as for hypothesis H4a, the results suggest that civic engagement had a significant and positive influence on the use of government websites in the first quartile (low levels of use,

Table 7
Summary of tests.

Hypothesis	Hypothesis testing according to modeling approach	
	OLS	Quantile
H1: Perceived usefulness	Not rejected	Partially rejected
H2: Perceived ease of use	Not rejected	Partially rejected
H3a: Trust in government	Not rejected	Not rejected
H3b: Trust in the Internet	Rejected	–
H4a: Civic engagement	Not rejected	Partially rejected
H4b: Democracy and citizenship	Rejected	–
H4c: Civic values	Rejected	–

$p < 0.01$) and in the third quartile (high levels of use, $p < 0.1$). The influence of civic engagement was larger in the first quartile, but the results for the third quartile should be taken with care, given that the estimators (β) and the significance level suggest that, in that quartile, the extent of influence of civic engagement on the use of government websites was low.

Table 7 shows the summary of the test of hypotheses.

Discussion

The perceptions of usefulness and ease of use had a generally positive influence on the use of government websites, what is in line with other studies (*e.g.*, Carter & Bélanger, 2005; Dimitrova & Chen, 2006; Weerakkody et al., 2013). Perceived usefulness was significant only during the stage of adoption (first quartile), that is, when the individual has a first contact with the technology (Venkatesh et al., 2003), whereas perceived ease of use was significant at moderate and high levels of use (the median, and the third quartile), that is, when the individual has already formed his/her view about usefulness.

The usefulness of e-gov services is associated with their efficiency and effectiveness, in particular for fighting corruption and making government actions more transparent (Avgerou et al., 2009). Government must invest in the perception of usefulness mainly among people who do not use government websites, since it is during the adoption stage that the benefits of e-gov should be promoted in order to motivate people to engage in e-gov (Shareef et al., 2011; Weerakkody et al., 2013). At the same time, government websites should address ease of use by identifying the real needs of the people. It would not be effective to allow people to access and pay bills through a website (usefulness) if the process is not user friendly (ease of use). Interface design, log analysis of e-gov services, and developing user guides are actions toward that end.

Trust in government had a fully positive influence on the use of government websites. The political and social environment should be addressed in order to understand the relationship between people and e-gov, given that cognition and emotions are key in this regard (Avgerou et al., 2009), such as in the case of developing trustworthiness. In our dataset, we found low values for the descriptive measures in the two dimensions of this construct. Since transparent and trustful electronic interactions with the government enhance the trust and the acceptance of e-gov (Carter & Weerakkody, 2008), we may conclude that the opposite is also true and that the political context in Brazil does not help the citizens to develop a more positive relationship with e-gov.

In Brazil, and particularly in its Northeastern Region, the main reasons for people not to engage in e-gov are the preference for personal contacts and the concerns about data security (CETIC.br, 2013). Improving the trust in government websites is critical; otherwise, people will resort to more traditional means – like the telephone and personal visits to government offices – in order to access the government (Srivastava & Teo, 2009; Teo et al., 2008). Actions toward transforming e-gov into a more instinctive and desirable means for citizens to exchange with government clearly include hearing from people what they demand from e-gov and taking the corresponding actions of institutional commitment and effectiveness (Srivastava & Teo, 2009). Although specific instances of government will not change on their own the broader political and social setting, trustworthiness by the citizens will tend to improve.

Civic engagement had a positive influence on the use of government websites during the initial stages of adoption (first quartile) and at high levels of use (third quartile). A possible explanation for this is that, at the low levels of use, people who report engagement in civic activities are more likely to interact with government by multiple means (Dimitrova & Chen, 2006), although they are still not engaged enough; and at the high levels of use, people are naturally engaged in e-gov as part of their civic attitudes.

In summary, when developing government websites, one should consider the presence of information, services and interaction for the benefit of civic engagement; and, for the particular case of Brazil, keep in mind that the context is unique in challenges due to its society being lethargic (De Pinho, 2011). The greatest investment at this moment should be targeted at promoting usefulness, ease of use, and trustworthiness of government websites through the mobilization of people in local and virtual forums in such a way that the citizens assume their incumbency for their own development and the development of their communities – and as such, they are likely to develop perceptions of how e-gov may help them in this intent and press government to do its part.

Conclusions

E-gov conveys a promising new set of tools and practices toward a more efficient and effective political society, but it requires a new mindset from both the public agents and the citizens. Our study addresses some important concerns that are behind the use of a particular e-gov tool – government websites. We measured the degree to which the perspective of citizens in a major Brazilian city about civic mindedness, trustworthiness, usefulness, and ease of use affect the use of government websites. The results show that each factor plays a different role according to the level of use of government websites by the citizens.

Our study emphasizes the need of addressing the demand side of e-gov. Although many public services in Brazil are being transferred to the online platforms, thus imposing the citizens to make use of them regardless of personal preferences or abilities, other services are still of voluntary use – and as such they will be effective only if the citizens are able to realize their benefits and incorporate them as part of a healthy political life. Among other benefits, e-gov may improve the efficiency of the public sector in many ways and ultimately address people's concerns more effectively – and save public money. Therefore, it is for the best interests of the citizens themselves to leverage the benefits that may stem from e-gov tools and practices.

An important concern is to improve the citizens' trust in the public agents. However, the current moment in Brazil is not favorable toward that end. Besides the long-time view that citizens have about politicians and the general political environment, currently the country faces an unprecedented fight against corruption practices that seem to be endemic to the Brazilian public and private sectors. Although the country is expected to improve its legislation and practices during and after this process, the citizens are increasingly skeptic about the public agents, what in turn harms the needed trust in government that would otherwise leverage e-gov voluntary use.

Although we took actions to prevent biases in data collection, some limitations of our study stem from our sample. We resorted to the biometric electoral registration offices in João Pessoa, a major city in Brazil, in order to collect our data from the citizens who voluntarily headed to those offices in order to update their voting profiles for the next voting period. We also took actions to enable everyone to answer our questions in those places. Nevertheless, since there was still plenty of time at that moment for all prospective voters to update their voting profiles until the stated deadline, most interviewees may be represented by two dominant strata: those who had vested interests in the upcoming voting period, and those who had a higher regard to broader citizenship. This impedes us to claim that our sample is fully representative of that city. Extending the findings to the general Brazilian population is also not possible, mostly because the Brazilian regions differ in important aspects.

Another limitation concerns the use of self-reported psychometric measures and the interviewees' interpretation of and interests on what is measured. It seems that problems occurred in this sense particularly when measuring some aspects of civic mindedness, given that a great deal of answers converged to a single point – the perception of what is expected from citizens, not what they may be actually doing. Also, the Brazilian public services are still in lack of more online tools and practices, so the citizens may not have a realistic view of what is really possible to do in order to enhance their own political role through the online means. If the needed improvements are not effected, the citizens' preference for personal contact with the public agents will continue to dominate and postpone the realization of e-gov benefits.

Conflicts of interest

The authors declare no conflicts of interest.

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