

ICT and citizens' trust in government: lessons from electronic voting in Brazil

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Abstract

The electronic voting system of Brazil is widely trusted by the citizens of the country and international observers as an efficient and reliable mechanism of producing elections results that accurately represent the choices of the electorate. In this paper we examine the conditions contributing to such an attitude of trust towards a government institution. We argue that the observed trust is only partly attributable to the trustworthiness merits of the technical system and its enactment procedures. Two other factors play a significant role in the formation of this trust, namely a positive predisposition of citizens towards ICT and towards the institutional actors responsible for the elections – the Superior and the Regional Electoral Courts. We therefore conclude that, unlike common assumptions about the potential of e-government to restore trust in government institutions in developing countries where such trust is lacking, the production of trust in ICT-mediated government services relies on the competencies of these institutions and citizens' perceptions of their trustworthiness.

Keywords: electronic voting, institutional trust, trustworthiness, Brazil, developing countries, e-government.

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Introduction

The research we present in this paper has been triggered by the concerns of international development agencies about the Latin American citizens' low degree of trust in democratic government institutions, as indicated by various opinion surveys (Latinobarómetro 2004; UNDP 2004). In current development thinking 'good government' - comprising transparency in decision making, efficient administration, effective accounting, a reliable legal system, social cohesion, avoidance of corruption, state capability and credibility - is a required for economic growth (Meier 2001). Economic development is understood to rely on effective institutions for well functioning markets (World Bank 2002). Lack of citizens' confidence in democratic institutions is a worrying sign of lack of propensity to cooperate, thus being an obstacle to economic growth. Against the background of such concerns, e-government programmes are generally expected to improve citizens' access to government services, to bring transparency of governments' decisions and activities, and to combat corruption in state administration, thus remedying the perceived problem of trust.

The opportunity for our research arose due to the Inter-American Development Bank's (IADB) interest in determining the potential of its sponsored e-government projects in the Latin American region to impact on citizens' trust in their governments. One of the ICT applications we chose to study is electronic voting in Brazilⁱ. A study of the use of ICT to support the conduct of elections is particularly pertinent to the question of citizens' trust in democracy because it concerns one of the most fundamental institutions of democracy and is used by all citizens above the age of 18ⁱⁱ.

In our research we take trust in democratic government to be a matter of trust in political institutions, such as the various agencies that deliver the services of the modern state. This notion of trust is distinct from trust in particular individuals occupying positions in government and administration.

In our empirical research we found a great deal of evidence that Brazil's electronic voting system is widely used and appreciated, and that the election results it produces are, with few exceptions, trusted to be the correct aggregate of individual citizens' actual votes. Yet, the formation of plausible cause and effect relationships between a technical/institutional arrangement and trust as expressed in citizens' opinion surveys and demonstrated by their actions posed a theoretical challenge. Despite a substantial literature on trust in political theory and a growing body of research on the issue of trust in the field of information systems, we did not find a satisfactory theoretical platform that could direct our research in terms of what socio-technical properties and associations we should look for to explain, predict, or direct action towards maintaining trust. Thus, the research we undertook sought to form theoretical associations between ICT uses in government and trust and to explore empirically their validity.

The paper is structured as follows. In the next section we introduce the concepts pertaining to the question of trust in this research and identify distinctions and relationships to investigate in the empirical study. We then describe our research in terms of data collection method and process of analysis. In the following section we describe the electronic voting system and its government institutional setting and broader social context and present an assessment of its role on the election process and its results. In the discussion section that follows we use our analytical concepts to unravel the way this technology innovation may be associated with changes in the Brazilian citizens' attitude of trust in elections and in democratic government at large. Finally, in the conclusions we draw some answers to the question whether and under

what conditions e-government can be a mechanism for restoring citizens' trust in government institutions.

Disentangling concepts

A large and dispersed literature has highlighted the significance of trust in modern societyⁱⁱⁱ. Indicatively, in economics and politics trust is a necessary condition for the functioning of the market and the political system (Fukuyama 1995; Putnam 2000; Williamson 1975); in sociology and organizational theory trust is often juxtaposed to the need for control of social systems (Gambetta 1988; Giddens 1991; Luhmann 1979). Giddens pointed out the significance of actively creating trust in the expert systems that make the fabric of late modernity (Giddens 1990; Giddens 1994). In IS, a stream of publications have reported research on trust as it pertains to new forms of business enabled by the internet, such as virtual teams, and e-commerce and e-government (Ba et al. 2002; Jarvenpaa et al. 1999; Jarvenpaa et al. 2004; Piccoli et al. 2003).

This literature convincingly argues for the significance of individuals' attitude of trust towards others as well as towards mechanisms of their societies. But beyond agreement on the general thesis on the importance of trust in modern society there are many controversies regarding the nature of 'trust' and the conditions that foster it. One area of contention, for example, is the extent to which trust in government institutions depends on interpersonal trust (Levi 1998; Putnam 2000). Some political theorists argue that the trust individuals form through their lives towards strangers and collectives of strangers in their communities plays an important role in developing trust in the impersonal political institutions of modern democratic societies (Hardin 1998). Others reverse the causality between interpersonal and political trust. They argue that face-to-face, community based, relations play a limited role in building trust in the institutions of complex societies. Instead, they emphasize the importance of legal and institutional mechanisms, such as the courts of justice, elections, property rights, for fostering trust in other members of a society (Cohen 1999; Fukuyama 1995; Levi et al. 2000; Zucker 1986).

Thus, current theory does not provide an answer to the question of why and how ICT use may strengthen citizens' trust in government. Therefore, we set out to construct a theoretical suggestion for our research question. We start by exploring the conceptual distinctions and relations that may allow us to unpack the common sense view that considers ICT-related improvements of transparency, efficiency, corruption, etc., in the operations of government organizations as a mechanism to increase citizens' trust in government institutions.

The first such distinction we draw is between *trustworthiness* as a property of a system, a government service, or an institution, and *trust* as a behavioural attitude of citizens. We point out that increases in the trustworthiness of a system may not be accompanied by increases in citizens' trust in the system. The second distinction we need to make concerns the 'systems' which are implicated in the formation of citizens' trust. In other words, we need to demarcate relevant levels of analysis regarding the object of trust: ICT, an e-government service, a government institution, or a regime of government at large. The main focus of our analysis in this paper is the association between an ICT system and the government institution within which this system is embedded and is intended to support.

Trustworthiness vs trust

The concept of trustworthiness refers to the properties through which a trusted entity (whether another person or an institution) serves the interests of the truster, while trust reflects the truster's beliefs, or perceptions, of the entity's trustworthiness (Levi et al. 2000). This distinction between trustworthiness and trust has received a great deal of attention in studies of trust in advanced democracies where surveys show widespread suspicion to the performance of almost all established institutions, such as schools and health care systems.

One of the paradoxes in that context is that measures designed to monitor and demonstrate trustworthiness, such as performance indicators, tend to accentuate the problem, perpetuating a climate of suspicion (O'Neill 2002). That is, even when performance indicators suggest improvements of services, citizens continue to place low trust in the institutions delivering them.

Two main reasons are discernible in the literature for the mismatch between the trustworthiness merits of a government service and the trust it enjoys (Levi et al. 2000; O'Neill 2002). First, the willingness of citizens to rely on a service depends on their judgment of the overall social and political context that sustains them and is shaped on the basis of more general beliefs and political predispositions. Second, the perception of trustworthiness relies on the cognitive and emotional capacity that individual citizens bring to bear on their experience of a service, on indicators used to describe aspects of trustworthiness, or on informants, such as the media. All of these may misinterpret or misrepresent the merits of the service, either towards misplaced trust, or towards excessive suspicion.

Therefore, while it is reasonable to expect that the development of trustworthy e-government services potentially contributes to citizens' trust in the agency, it does not determine it. Citizens' perception of the trustworthiness of a government agency is mitigated by their expectations and beliefs about its political underpinning. For example, citizens' view of the merits and fairness of the policy legislation that a government agency enacts may contribute to a general attitude of suspicion towards it, which conditions the way they perceive its services.

Trust in ICT and trust in ICT-mediated services

The expectation that improvement of the trustworthiness of government agencies through the use of ICT will result in citizens' trust in government entails the assumption that ICT itself will be a trusted interface to a government agency, or a trusted actor involved in the performance of the agency's task; but the validity of such an assumption cannot be taken for granted.

In the information systems literature it is recognized that, even if successfully implemented, the e-government services themselves may not be trusted adequately to be used and therefore their adoption is itself in need of trust-building mechanisms (Carter et al. 2005; Warkentin et al. 2002). Based mainly on the technology acceptance model (TAM), the literature has suggested that, in order to be adopted, e-commerce and e-government technologies must be perceived to be useful and easy to use. In addition the IS literature on trust has emphasized the importance of the technology-based transactions being perceived as secure (Carter et al. 2005; Gefen et al. 2003; Salam et al. 2005). The usefulness of e-government services are usually associated with specific performance improvement objectives, such as efficiency and effectiveness in delivering a range of services, reduction of corruption, or transparency in the conduct of administration. The issue of security is understood to point to the need for institutional mechanisms that safeguard integrity of transactions, such as certification and escrows (McKnight et al. 2002; Pavlou et al. 2004; Warkentin et al. 2002).

One of the limitations of TAM-based explanations is that, taking a narrow perspective of a user-artifact relationship, they cannot account for the origin of the user perceptions. The more crucial question why citizens may perceive an ICT-mediated transaction as trustworthy (useful, easy, and secure) requires consideration of their existing pre-disposition to ICT, as was demonstrated in a study of the implementation of a GIS system in India by Barrett et al (Barrett *et al.* 2001). Such a pre-disposition is formed from prior experience of citizens with ICT, as well as from a shared community view of the practical and symbolic significance of ICT, which is generally captured in the term 'ICT culture' (Leidner et al. 2006).

Research Process

We identified the electronic voting system of Brazil as a case suitable for understanding the ICT and trust in government relationship through its reputation as a case of successful use of ICT in the government sector. The Brazilian author of this paper confirmed the validity of the reputation and offered valuable insights for the conduct of the case study and the interpretation of collected information.

Most central in our research effort has been our observation of two occasions of Brazilian elections: the second round of the municipal elections in the city of Sao Paulo on 31 October 2004, and the first round of the general elections of 2006, on 1st October, for President, Senate, Federal Congress and States Government offices. During the 2004 elections we were part of a group of visitors at the Tribunal Electoral Regional (TRE) of the state of Sao Paulo and observed the 'system in action' in two voting stations. During the 2006 elections two of the authors were part of a group of foreign visitors at the TRE of the state of Rio Grande do Sul, in Porto Alegre. We followed a three-days programme that involved demonstrations of the system and description of its technical features and institutional setting, and observation of the installation and preparation of the system in a voting station, of the voting process in three voting stations, of the closing of the ballot and the collection of results in a regional results collection centre.

On both visits we conducted a series of interviews with technical staff at the TREs of Sao Paulo, and Porto Alegre and at the Tribunal Superior Eleitoral (TSE) in Brasília. Thus we formed detailed descriptions of the technology features of the e-voting system and its development process. We held interviews with TSE and TRE officials at both senior and operational levels and formed an in-depth understanding of the organizational setting and institutional features of the elections in Brazil, as well as the changes these have undergone as part of the implementation of the electronic voting.

Also, we interviewed five individuals who have criticized the trustworthiness of the electronic voting system and we sought to understand their concerns. In addition, we collected relevant documentation and academic literature and sought the opinion of local political and social scientists, as well as members of staff of three NGOs, namely, Transparency International in Sao Paulo, INESC in Brasília, a Jesuit mission in a favela of Porto Alegre.

Our study followed a gradual process of research question and argument refinement through the formation of a succession of general conjectures regarding ICT and citizens' trust and case-specific analyses. The first cycle of our empirical study, during the 2004 elections, started with a broad sensitization from the general multi-disciplinary literature about trust – as presented in the previous section of this paper - and sought to establish the features of trustworthiness of the system and the conditions that made these features possible. From that study we became aware of technology security concerns voiced by computer engineers and some political scientists and noticed that, despite of such voices, voters and the political parties did not show signs of mistrust of the election process. Two other observations emerged from our data collection: first, that the TSE and TREs were continuously cultivating trust in the electronic elections process and second that the trust in the electronic voting system was reinforced by a general positive attitude towards ICT among citizens. We therefore formed the conjecture that trust in the Brazilian ICT-mediated elections implicates three analytically distinguishable elements of trust: the perception of trustworthiness of the electronic voting system; the trust predisposition of citizens towards the election authorities; and their trust predisposition towards ICT.

Consequently the second round of our theory review and empirical research focused on confirming the validity of this conjecture and exploring its consequences regarding the role of ICT as a mechanism of trust.

Electronic voting in Brazil

The institutional context

Brazil is a presidential and federative republic composed of twenty-six states and the Federal District (Brasília). The authority responsible for the conduct of electoral affairs is the Tribunal Superior Eleitoral (TSE). TSE has jurisdiction over all aspects of elections and regulates the functioning of political parties. The electoral law in Brazil is revised every two years, in correspondence with a new turn of elections. It is the TSE's responsibility to draft a law resolution to submit to the legislative power for approval. The TSE, over the years, has developed a high reputation for trustworthiness, competence, and autonomy in the management of the electoral process. Therefore, the content of this draft is rarely debated by the legislative.

The management of the elections process is delegated to the Regional Electoral Courts (TRE – Tribunal Electoral Regional). Each Court is formed of three judges, who belong to the State Court of Justice. Each State is divided into Electoral Zones, and the total number of electoral zones in the country is 2,900.

The development of the e-voting system

At the beginning of 1995, the TSE formed a task force comprising staff from the TSE and the TREs and financed by the World Bank. The objectives of the task force were to stop fraud and to strengthen political participation and inclusion by simplifying the voting system. The existing system required people to read the names of candidates from a list and to write down their names on the ballot paper, but the level of illiteracy in Brazil was very high, close to 30% of the population. Therefore, they perceived a pressing need not only to improve the user-friendliness of the interface (the ballot paper), but also the knowledge-base required to participate to the process.

After six months the task force produced a proposal for the development of a computerized ballot box and invited technical experts from Federal ministries to participate in defining the system's technical requirements and specifications. At the beginning of September 1995, a team of fourteen technical specialists started working on the system's development and in May 1996 the first copy of the electronic voting machine was released. The machine was tested for the first time in the Municipal elections of October, 1996. The test included all cities with more than 200,000 voters and all state capitals, which involved 33% of the voters. A second test was run for the general election of 1998. This test included all cities with more than 40,000 voters, reaching 67% of the voters. Finally, the system was used in the whole country for the municipal elections of 2000.

Elections preparation

The preparation process starts in December of the year before the elections when the TSE submits to the parliament a draft resolution to update the electoral law. The document does not include technical descriptions of the e-voting system; it reflects the changes needed to enact the law into a new version of the system. The resolution proposed has to be approved by the parliament in March. The TSE, at this point, has one month to review the system according to the requirements specified in the approved resolution.

180 days before elections the software development stops and the new source code is made available to the technical experts of political parties to detect whether the system complies with the law approved. Sixty days before the elections the software is sealed during a public ceremony. Political parties' and civil societies' representatives are invited to participate in order to digitally sign the compiled copy of the software code. During this ceremony a sequence of major events take place. The first is the generation of hash function tables. The second is the digitally signing of the compiled version of the software source code. Finally, the software applications, digitally signed and encrypted, are distributed to the TREs.

A few days before the elections each TRE loads all e-voting machines with the candidate (name, number, party or coalition abbreviation and photo) and voters tables and the software applications. Political parties' representatives are required to attend this loading process. The validation of the loading process is made on a sample of three per cent of the overall population of e-voting machines randomly selected by Parties' representatives.

The day before the elections e-voting machines are put in place. However, a percentage of these machines, depending on the number of voters in the State, are taken back to TRE for a simulation of a voting session that consists of two ballot boxes: the electronic voting system, and the traditional ballot box. A sample of randomly collected votes are cast in both systems and the results are compared for consistency.

At 7.30 a.m. on the election day, the president of the precinct turns on the e-voting machine at the presence of voting board's representatives and political parties' ones. The e-voting machine prints out automatically a report, called "zeresima", which certifies that the ballot box is empty, i.e. that there is no candidate with a pre-assigned number of votes.

Functional description of the e-voting system

The voting machine consists of two terminals installed in each polling station. The first is the voting board representatives' terminal and has a numerical keyboard with a two lines liquid crystal screen. It is used by the board representative to type a voter's identification number. If he or she is registered in the precinct, his or her name is displayed on the screen and the identification is accomplished. The board representative checks on the screen the status of the voting machine and, if available, presses 'enter' to turn the machine on the ready state.

The second terminal is the voters' one. When the voter enters the booth, the machine should be on the ready state. The voter terminal is also formed of a keyboard and a liquid crystal display. The voter expresses his/her preference by typing their candidate identification number. The screen shows the candidate's name, initials of the party or coalition he or she belongs to and his or her photo, and if these are correct, voters press enter to confirm. The keyboard has two additional keys: the first is the correction key that allows voters to re-start the process, the second is the blank vote key.

At 5 p.m. of the election days the president of the precinct uses his or her password to close the voting machine and to print a voting machine report for the precinct. This report contains the following information: precinct's identification code; voting machine's identification code; number of voters who attended and voted; total voting results for each candidate.

The report is printed in five copies. These five copies are signed by the president of the precinct and by the representatives and inspectors of the political parties. One copy is displayed announcing the results of the precinct. Three copies are enclosed to the precincts register and sent to the electoral committee. The last copy is delivered to the political parties committee. If required, the machine can print out five additional copies that can be distributed to the district attorney of the political parties, to representatives of the press and to the public prosecution office. The copy that is delivered to the political parties committee is extremely important, because it allows parties to check whether the data have been modified during transmission. Upon data reception, the TRE and the TSE send an electronic receipt to political parties.

The voting machine program saves the data on a diskette in an encrypted format to prevent data modification and the diskette is delivered to the local electoral committee. Data are then decrypted and uploaded with a "guiding program". The process, at this point, varies according to the type of election. In the case of municipal elections the data is totally-added at the precinct of the municipality and then transferred to the local TRE and to the TSE. In the case of general election the data are read at the precinct that corresponds to the municipality and transmitted to the local TRE and to TSE. The data on votes for the President of the Republic are added up and announced by the TSE.

The technical trustworthiness of the entire system is ensured by a security infrastructure aiming at preventing data from being intentionally or unintentionally modified and/or deleted. The security of the system comprises the system audit program, which records all transactions performed on the particular machine, and the system security program, which prevents any tampering with the voting machine, such as the removal of the diskette on which election votes are stored.

Discussion

System trustworthiness

The electronic voting system of Brazil has several qualities that make it, and consequently the electronic voting process, trustworthy. First it satisfies the basic criteria of easiness of use and usefulness suggested in the IS literature on trust. The voting machine has a very simple interface, comprising an unambiguous presentation of voting options, confirmation and cancellation procedures, pictures of candidates and Braille coding on the buttons to secure universal access including illiterate and blind people.

There are clear efficiency benefits. The fast and un-crowded voting experience created a relaxed and almost celebratory atmosphere at the voting stations we visited. Many parents took their young children with them to the voting booth to show them how they used the machine. The judges do not now spend time at voting stations overseeing the voting; instead they concentrate their attention to other potential types of electoral fraud, such as political parties influencing the voting choices at the vicinity of the voting stations. Moreover, there are large efficiency benefits in the counting of votes and therefore the speed in announcement of the election results. Indicatively, in the 2004 municipal elections 99% of the votes (more than 100 million votes) were counted within five hours from the closing of the voting stations.

The security of the system is a contentious matter. The system makes extensive use of digital authentication mechanisms and encryption techniques (for the software loaded on the machines as well as the votes cast) as well as physical security measures, such as the paper sealing and signing of the disk and flash card entrance slots of the machines. There is also a range of possibilities provided by the TSE for auditing of the system. Yet, some computer scientists, political scientists, journalists, legal experts, and a small political party have voiced concerns^{iv}. Central among their criticism of the system security is the lack of a paper log of votes. Although the system has recently been amended to record individual votes (in random order in order to maintain anonymity of voting) the totally electronic form of the votes precludes resorting to the counting of votes recorded on paper in case there is a dispute. There are also concerns about inadequacy of the auditing allowed prior to the elections. Complaints include the limited parts of source code available to political parties for inspection (the commercial operating systems of some of the machines is a particular cause of concern) and the lack of testing of the systems performance by political parties representatives and other interested individuals. Moreover, the current identification of voters at the voting station is considered unsatisfactory.

This last point is the only concern the TSE acknowledges as valid and is now considering the implementation of electronic means of voters' identification, such as checking of fingerprints. The TSE considers the printing of votes to be a source of inefficiency and, potentially, of fraud^v. Similarly, limitations of auditing are considered necessary precautions against external interference with the system. For example, allowing hands-on testing of the system may open possibilities of altering the software code before the digital sealing.

Evidence of trust

It is generally difficult to get a reliable assessment of citizens' trust. Results of opinion surveys are often contradicted by citizens' behaviour (O'Neill 2002). In this case both opinion surveys and behaviour indicators suggest that the Brazilians' trust in their country's election process is

high. A survey of citizens' trust in institutions conducted by non-governmental agencies^{vi} in 2004 showed that 81.5% of the respondents have full or partial confidence in the Electoral Justice institution, with 89.5% of them judging positively the services it provides, and 96.7% judging positively the speed of the counting of votes.

Moreover two behavioural indications suggest trust in the elections process: lack of disputes of election results and increases of valid votes. We found no disputes over results, even in cases that the votes gained by competing candidates were very close. There are no incidents of challenging the validity of the votes counts such as those in the much publicised cases of electronic voting in USA states.

Voting is compulsory in Brazil, and therefore the number of people voting is not a good indication of their trust in the elections institution. However, there has, at various periods, been a large proportion of invalid votes. In the 1990 and 1994 elections (i.e. before the electronic voting system) the rate of invalid votes^{vii} exceeded 40% of the ballots cast. In 1998 the invalid votes fell by half, and in 2002 - when the system as used in the whole country - they fell again to 7.6% of the total number of votes cast. Although there may be several factors contributing to the reduction of invalid votes, political analysts attribute it partly to the introduction of the electronic voting system and explain it as a matter of simplifying the previous too complex manual system of voting and counting of votes^{viii} (Limongi 2006).

E-voting system trustworthiness and institutional trust

There is therefore evidence that the electronic voting system is contributing to a general attitude of trust in the voting part of the Brazilian elections^{ix} and, as we discussed above, this is partly justified by the trustworthiness merits of the electronic system. Two other factors seem to be implicated in this attitude of trust, namely a general predisposition of trust towards ICT and the perceived trustworthiness of the TSE and TREs.

Trust in ICT as a modernizing and facilitating means for government and the economy is widespread amidst the middle income population of Brazil. The country made an early start in the use and production of IT and pursued sustained computerization efforts despite its frequent crises of economic and political instability (Tigre 2003). Government computerization (and more recently e-government) tapped onto and further contributed to the development of local ICT expertise^x. Advanced ICT use in the banks at the period of hyperinflation of the 1980s familiarized citizens with ICT as a trusted facilitator of services. Today Brazilians make extensive use of electronic payment systems and e-commerce increases rapidly^{xi}. They came to expect similar convenience from their transactions with the government sector. There have been many efforts by Federal, State, and Municipal governments, as well as by NGOs to provide access to ICT in poor communities throughout the country, spreading the message that ICT is *sine qua non* for inclusion in the modern economy. Today the Brazilian government has in place layers of IT infrastructure in most of its agencies, electronic transactions with business and banks, and an increasing range of internet transactions with citizens.

Existing trust in the TSE and the TREs complements the technical trustworthiness of the electronic voting system and the procedures for its auditing. In effect, the security of the system is considered robust in terms of preventing external fraud – though not un-breachable - but relies heavily on the guardian authorities, the TSE and the TREs. Indicatively, in addressing requests for strengthening the technical and auditing means for the security of the system, the TSE replied ‘the guarantee of the security of the electronic elections is us’^{xii}. The TSE is a competent and powerful actor in the political system of the country. It is actively cultivating trust in the election system by demonstrating the electronic system through television and school education, and creating publicity about the preparation of the electronic elections.

In short, while the e-voting system is undoubtedly contributing to the perception of Brazilian elections as an efficient and fair exercise of a democratic right, it relies on trust in the

competent protection of the TSE to play its facilitating role securely. The system is trusted to the extent that the TSE is trusted not to abuse its power. The TSE, already very powerful in the Brazilian politics^{xiii}, has boosted its legitimacy by modernizing elections through a domestically made trustworthy technology that is highly praised internationally and is now transferred to other countries. At the same time, its own trustworthiness is a necessary element for fraud-free use of the electronic system. The positive ICT culture has contributed to the wide acceptance of electronic voting^{xiv}. And through the electronic elections, ICT further gained in popularity as means that modernize the state and boost the economy, used by all, rich and poor, and facilitating a democratic institution.

Conclusions

We can now address the question that triggered our research regarding the possibility of e-government to restore citizens' trust in democratic government. The voting system in Brazil is one of few cases of electronic elections that enjoy high level of trust by all categories of stakeholders: the judges that manage the election process, the voters, the political parties, the NGOs promoting development, the press. It is, therefore, indeed a successful show-case of e-government and trust.

However, as we argued in our discussion, this is not a case of ICT remedying the broken confidence of citizens in a political institution, but a case of mobilizing ICT by a powerful political actor with the reputation of a trustworthy guarantor of democratic elections. It is very doubtful that the electronic voting system would have increased citizens' trust in the elections had the TSE itself not been trusted to be committed to its mission of fair elections. Moreover, this case of e-government built on existing technological competence and a propensity of citizens to welcome government initiatives for ICT innovation. Such conditions of ICT competence and culture are not common in many developing countries, most of which rely on transferring ICT from abroad and often face suspicion about its appropriateness. Thus, we interpret this case as demonstrating that e-government requires active trust formation in ICT and government institutions, rather than overcoming their perceived trustworthiness deficiencies.

References

- Ba, S., and Pavlou, P.A. "Evidence of the effect of trust building technology in electronic markets: price premiums and buyer behavior," *MIS Quarterly* (26:3) 2002, pp 243-268.
- Barrett, M., Sahay, S., and Walsham, G. "Information technology and social transformation: GIS for forestry management in India," *The Information Society* (17:1) 2001, pp 5-20.
- Carter, L., and Bélanger, F. "The utilization of e-government services: citizen trust, innovation and acceptance factors," *Information Systems Journal* (15:1) 2005, pp 5-25.
- Cohen, J. "Trust, voluntary association and workable democracy: the contemporary American discourse of civil society," in: *Democracy and Trust*, M.E. Warren (ed.), Cambridge University Press, Cambridge, 1999, pp. 208-249.
- Fukuyama, F. *Trust: the social virtues and the creation of prosperity* Free Press, New York, 1995.
- Gambetta, D. (ed.) *Trust: Making and Breaking Co-operative Relations*. Blackwell, Oxford, 1988.

- Gefen, D., Karahanna, E., and Straub, D. "Trust, and TAM in online shopping: an integrated model," *MIS Quarterly* (27:1) 2003, pp 51-90.
- Giddens, A. *The Consequences of Modernity* Polity Press, Cambridge, 1990.
- Giddens, A. *Modernity and Self-Identity* Polity Press, Cambridge, 1991.
- Giddens, A. "Risk, trust, reflexivity," in: *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*, U. Beck, A. Giddens and S. Lash (eds.), Polity Press, Cambridge, 1994, pp. 184-197.
- Hardin, R. "Trust in Government," in: *Trust and Governance*, V. Braithwaite and M. Levi (eds.), Russell Sage Foundation, New York, 1998, pp. 9-27.
- Jarvenpaa, S.L., and Leidner, D.E. "Communication and trust in global virtual teams," *Organization Science* (10:6) 1999, pp 791-815.
- Jarvenpaa, S.L., Shaw, T.R., and Staples, D.S. "Toward contextualized theories of trust: the role of trust in global virtual teams," *Information Systems Research* (15:3) 2004, pp 250-267.
- Latinobarómetro "Una década de mediciones.," Corporation Latinobarometro, Santiago de Chile.
- Leidner, D.E., and Kayworth, T. "A review of culture in information systems research: toward a theory of information technology culture," *MIS Quarterly* (30:2) 2006, pp 357-399.
- Levi, M. "A state of trust," in: *Trust and Governance*, V. Braithwaite and M. Levi (eds.), Russell Sage Foundation, New York, 1998, pp. 77-101.
- Levi, M., and Stoker, L. "Political trust and trustworthiness," *Annual Review of Political Science* (3) 2000, pp 475-507.
- Limongi, F. "Reformas Institucionais, Participação, Competição e Inclusão Política," University of São Paulo, 2006.
- Luhmann, N. *Trust and Power* John Wiley, Chichester, 1979.
- McKnight, D.H., Choudhury, V., and Kacmar, C. "Developing and validating trust measures for e-commerce: an integrative typology," *Information Systems Research* (13:3) 2002, pp 334-359.
- Meier, G.M. "The old generation of development economics and the new," in: *Foundations of Economic Development*, G.M. Meier and J. Stiglitz (eds.), Oxford University Press, Oxford, 2001, pp. 13-50.
- O'Hara *Trust: from Socrates to Spin Ikon*, Cambridge, 2004.
- O'Neill, O. *A question of Trust* Cambridge University Press, Cambridge, 2002.
- Pavlou, P.A., and Gefen, D. "Building effective online marketplaces with institution-based trust," *Information Systems Research* (15:1) 2004, pp 37-59.
- Piccoli, G., and Ives, B. "Trust and the unintended effects of behavior control in virtual teams," *MIS Quarterly* (27:3) 2003, pp 365-395.

- Putnam, R.D. *Bowling Alone: the collapse and revival of American community* Simon & Schuster, New York, 2000.
- Reed, M.I. "Organization, trust, and control: a realist analysis," *Organization Studies* (22:2) 2001, pp 201-228.
- Salam, A.F., Iyer, L., Palvia, P., and Singh, R. "Trust in e-commerce," *Communications of the ACM* (48:2) 2005, pp 73-77.
- Tigre, P.B. "Brazil in the Age of Electronic Commerce," *The Information Society* (19:1) 2003, pp 33-43.
- UNDP "Democracy in Latin America: Towards a citizens' democracy.," United Nations Development Programme, New York.
- Warkentin, M., Gefen, D., Pavlou, P.A., and Rose, G.M. "Encouraging citizen adoption of e-government by building trust," *Electronic Markets* (12:3) 2002, pp 157-162.
- Williamson, O.E. *Markets and Hierarchies: Analysis and Antitrust Implications* Free Press, New York, 1975.
- World Bank "Building Institutions for Markets," New York.
- Zucker, L.G. "Production of trust: institutional sources of economic structure, 1840-1920," *Research in Organizational Behavior* (8) 1986, pp 53-111.

ⁱ We studied also the electronic tax systems in Brazil and Chile, the electronic procurement system in Chile, and public sector budgeting system in Brazil. For a description of the whole project and its findings, see: <http://www.iadb.org/sds/doc/ROLE%2010%2D28%2D05finalweb.pdf>.

ⁱⁱ In Brazil voting is obligatory for citizens aged 18 to 65 and voluntary for those aged 16 to 18.

ⁱⁱⁱ Several voting books and articles have attempted to take stock of the large multidisciplinary literature on trust, see for example O'Hara *Trust: from Socrates to Spin Ikon*, Cambridge, 2004, Reed, M.I. "Organization, trust, and control: a realist analysis," *Organization Studies* (22:2) 2001, pp 201-228.

^{iv} See <http://www.votoseguro.org>; Amílcar Brunazo Filho & Maria Aparecida Cortiz *Fraudes & Defesas no Voto Electronico*, AllPrint, São Paulo, 2006.

^v Up to the 2002 elections the voting machines produced printed votes too. The printing of votes was deemed a source of inefficiency, causing delays in the voting process with frequent printer failures. Moreover, printed votes were considered by the TSE to be a further source of fraud, as voters could potentially corrupt them and claim inconsistency between their printed vote and the count of the electronic system. The digital recording and signing of every vote, introduced in 2004, is considered by the TSE a more effective proof of the accurate counting of votes produced by the system.

^{vi} TV Cultura and the Nexus Institute.

^{vii} Invalid votes includes blank votes and null votes, both of which are discarded at the election results counts.

^{viii} Electronic voting appears to have made a difference in the null votes of the proportional elections for the House of Parliament and State Congress, which had very complicated ballot papers. They made no positive difference in the majority elections for President, for which indication of choice of candidate was relatively simple in the paper ballot too.

^{ix} There was a great deal of public concern about other types of electoral crime, mainly of candidates buying of votes and political parties influencing unfairly the choices of voters. The reputation of the TREs and the TSE lies heavily on their judicial role for such cases of fraud.

^x The e-voting system itself (hardware and software) has been developed with indigenous expertise and there are deals to sell it in other Latinamerican countries interesting in adopting electronic elections.

^{xi} For indicators of use of electronic payment systems, see <http://www.bcb.gov.br>; for indicators on e-commerce in Brazil, see <http://e-commerce.org.br>.

^{xii} From an interview with a political scientist, activist of 'voto seguro'.

^{xiii} The TSE is both regulating elections and enacts its regulations. Its accountability is therefore weak.

^{xiv} It is indicative of the relative trust of the Brazilian citizens in ICT that we did not come across any privacy concerns for the electronic elections, even about the plans for introducing electronic identification at the voting stations.