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Research Article

Explaining Trust in IT-Mediated Elections: A Case Study of E-Voting in Brazil

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Abstract

In this paper, I trace social mechanisms for the development and continuation of citizens' trust in e-voting. My research focuses on the processes that give rise to trust-related behavior, and identifies mechanisms that explain trust in e-voting. I distinguish between initial formation and recurrent manifestation of trust, and propose models of causal processes to explain them. I frame the research on trust in e-voting as a case of political trust in the socio-technical entity of the electoral authorities and the e-voting system, and draw from general socio-technical theories and literature on trust to construct relevant concepts and relationships. Empirically, this theory-building exercise traces the process of the initial development of trust in e-voting in Brazil in the 1990s and the maintenance of this trust in the conduct of Brazilian elections since then. The social mechanisms of trust that I derive from this study are associated with the process of democratization and continuing care towards adjusting the e-voting system to serve legitimate objectives for the conduct of elections, the interdependence of citizens' perception of the trustworthiness of the technology system and the trustworthiness of the electoral authorities, and the fostering of a positive attitude towards IT by government policy.

Keywords: Trust, Political Trust, E-Voting, Social Mechanisms, Brazil.

* Dubravka Cecez-Kecmanovic was the accepting senior editor. This article was submitted on 11th July 2011 and went through three revisions.

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1. Introduction

In most countries, the use of IT in elections has been fraught with public suspicion. Many European countries, including the UK and France, make almost no use of electronic voting technologies. Indicatively, a “digital rights advocacy group”, which observed a pilot trial of electronic voting in England and electronic counting of votes in Scotland in 2007, concluded that they “cannot express confidence in the results declared in areas observed” (Open Rights Group, 2007). European countries that introduced electronic voting machines in the 1980s and the 1990s, including Belgium, Norway and Spain, only very cautiously extended the geographic coverage of electronic elections and upgraded the technologies, and they have not yet reached universal coverage. After using direct-recording electronic (DRE) voting technology in elections for a number of years, the Netherlands withdrew it in 2007 in response to a grassroots citizens’ campaign, called “We do not trust voting computers”, which demonstrated security problems of the system and flaws in the election process (Loeber, 2008; Oostveen, 2010). In the US, where several technologies for electronic elections have been deployed in a number of states over the past few decades, their performance is closely monitored amidst widespread apprehension. The contestation of the Florida election results in the 2002 Presidential elections left a legacy of public concern about risks of disenfranchising due to technology-caused spoilt votes or misrepresentation of citizens’ preferences.

Given that the use of voting technology is not usually a matter of citizens’ choice, the issue that arises in this area of technology innovation and use is not one of adoption but of trust in the faithfulness of the election results as a representation of citizens’ candidate preferences. Experts’ analyses contain warnings that the use of electronic technologies in elections entails serious risk, which provides a technical/rational basis for citizens’ suspicion. Risks include security breaches, inefficiencies and election disruption in cases of technology malfunctioning, and influence of voters’ choices and thus distortion of their preferences (Calvo, Escolar, & Pomares, 2009; Oostveen & van den Besselaar, 2005). These are associated with the physical properties of the artefacts that comprise the electronic voting technologies, and with organizational shortcomings and motives of government agencies in charge of the elections, technology developers, and third-party service providers (Barr, Bishop, & Gondree, 2007; Bishop & Wagner, 2007; Dill & Castro, 2008; Oostveen & Van den Besselaar, 2004; Randell & Ryan, 2005; The Caltech/MIT Voting Technology Project, 2001).

A few cases of nationwide electronic voting (e-voting) that appear to have been used without raising much public concern stand out against this background of experts’ concerns and citizens’ distrust or suspicion; notable among them are the electronic elections of two of the most populous democracies, Brazil (Avgerou, Ganzaroli, Poulymenakou, & Reinhard, 2007) and India (Wolchok et al., 2010). Although the security of the technologies used in these countries’ elections has attracted controversy, their voting runs largely smoothly and efficiently with only minor sporadic contestations of results.

In this article I set out to trace the causal social mechanisms for the initial formation and continuation of citizens’ trust in e-voting. To that end, I draw from the experience of e-voting in Brazil. I started my study of e-voting in Brazil in 2004 with the assumption that a lack of public challenge of election results in a democracy was a good indication of citizens’ satisfaction with the trustworthiness of the way voting was conducted. Lack of manifestation of distrust in the elections results in Brazil is all the more surprising if it is compared to the Brazilians’ distrust of their government institutions and their constant concern about corruption. Surveys at the time I conducted my research suggested that “two-thirds of Brazilian people do not trust—to different degrees—parliaments, parties, executive branches, courts of law, as well as health, educational, and security/public services” (Moisés, 2006, p.593). My case analysis sought to explain the Brazilian citizens’ acceptance of elections results that e-voting produced by identifying the social mechanisms that contributed to the perception of trustworthiness of the voting’s conduct.

This paper develops theoretical propositions that explain the development of trust in e-voting. As an explanation by social mechanisms, my research is an effort of middle-range theory building. While it is informed by general socio-technical theories in information systems and theories of trust in

political theory, its purpose is to draw from a case study explanatory theory specifically for the development of trust in e-voting.

The structure of the paper is as follows: In Section 2, I review the literature of trust, with a focus on political trust in institutions. In Section 3, I frame this research as a study of trust in a socio-technical institution, and relate it to a conceptual model of conditions and relationships engendering trust. In Section 4, I position my study methodologically as process research that traces causal social mechanisms, and I provide details on the data collection method. In Section 5, I describe the beginning of e-voting in Brazil and the established process of preparing for and conducting such elections. In Section 6, I identify events and processes that contributed to Brazilian citizens' perception of trustworthiness and their consequently trusting behavior towards their country's e-voting. I thus derive sets of social mechanisms that form a rudimentary theory of trust in e-voting. In Section 7, I reflect on the nature of my contribution, comment on its significance, and I point out limitations of this research and further research directions. In Section 8, the conclusion, I comment on the importance of the explanatory model of trust in e-voting that I derived from the Brazilian case study, its completeness, and its generalizability.

2. On Trust

Trust is both a mechanism in the production of particular outcomes in many social phenomena and an outcome in its own right, the causal formation of which needs to be explained. Trust is, for example, identified as a facilitating mechanism in IT outsourcing (Sabherwal, 1999), commerce (McKnight Choudhury, & Kacmar, 2002), open source software production (Feller, Finnegan, Fitzgerald, & Hayes, 2008), and effective government (Braithwaite & Levi, 1998; Fukuyama, 1995; Hetherington, 1998). In this paper, I am interested in the way trust is initially created and subsequently maintained. A great deal of interest in this question across many fields of research has produced a rich and relevant interdisciplinary bibliography (Bachmann & Zaheer, 2006; Gambetta, 1988; Kramer, 2006b; Misztal, 1996; Rousseau, Sitkin, Burt, & Camerer, 1998). Nevertheless, existing knowledge does not provide a straightforward explanation of trust creation in IT-mediated phenomena, such as IT-mediated elections. On the contrary, a profusion of existing definitions and theoretical perspectives of trust makes research on this question a slippery and confusing effort, and necessitates positioning a study of trust amidst perspectives taken in multiple academic fields. To that end, I review the literature of information systems, organizational theory, and political theory to identify relevant research, first on trust in socio-technical institutions, and second on explanations of how trust is created and maintained.

In general, the notion of trust is understood to refer to a relationship between two parties: the trustor and the trustee. Trust is often contrasted with distrust. Nevertheless, several analysts have pointed out that this dichotomy misses the gradual way in which trust is achieved. The concept of "suspicion", which indicates a state of ambiguity rather than negation of trust, is often considered as a more appropriate differentiator of behavior involving trust (Kramer, 1999; Lewicki, Tomlinson, & Gillepsie, 2006).

A significant difference among studies of trust is the way in which they conceptualize the trustee; in other words, the nature of the object of trust (Table 1). Trustees can be individuals (one may trust or distrust a doctor for treating an illness) or collectives, such as organizations (one may trust or distrust a hospital, or the national health care system). In the IS field, studies of trust in e-commerce and electronic markets tend to focus on the e-vendor as a composite object of trust with two components: the sellers and the technology artefacts, mainly the web interface. They either focus on one of the two (Ba & Pavlou, 2002; Pavlou & Gefen, 2004), or consider them both as independent variables (Gefen, Karahanna, & Straub, 2003). Trust in e-vendors is taken to be a matter of interpersonal trust (Ba & Pavlou, 2002; Pavlou & Gefen, 2004). Regarding technology artefacts, IS research on technology-mediated phenomena tends to draw from the technology acceptance model (TAM), and considers perception of technology usefulness and of ease of use (Gefen, Karahanna, & Straub., 2003). Additionally, it addresses concerns about security and perception of risk (Pavlou, 2003; Warkentin, Gefen, Pavlou, & Rose, 2002). A noticeable exception is the modelling of trust in technology by McKnight and Thatcher (2004) (cited in McKnight & Chervany, 2006) as a set of constructs that are similar to trust in another person.

Relevant to my research on trust in e-voting is the literature on trust in government institutions. The IS and management literature frequently evokes institutions as mechanisms engendering trust in other entities (McKnight et al., 2002; Pavlou & Gefen, 2004), but rarely takes institutions as objects of trust in their own right. For literature relevant to trust in institutions, I turn to organizational theory/sociology (Gambetta, 1988; Hardin, 2002; Luhmann, 1979; Möllering, 2006b; Shapiro, 1987; Zucker, 1986) and political theory (Braithwaite & Levi, 1998; Espinal, Hartlyn, & Kelly, 2006; Hardin, 1998, 2002; Levi & Stoker, 2000; Mishler & Rose, 2001; Tolbert & Mossberger, 2006; Warren, 1999; Welch, Hinnant, & Moon, 2004). The institutional organizational theory literature has paid attention to trust in institutions, and assumes that, when institutions serve as a source of trust between actors, they are also objects of trust for these actors (Möllering, 2006a; Sydow, 2006). Institutions are seen as social systems with institutionalised roles of conduct, routines, and control mechanisms. In political theory, there is interest in institutionalised conduct of government. A core notion of the field, political trust, is understood either as an extension of interpersonal trust (Job & Reinhart, 2003; Levi, 1998; Offe, 1999; Putnam, 2000) or as trust in the institutions of government (Warren, 1999). Indicatively, measurements of political trust that are routinely derived in most countries from national surveys data include assessment of both interpersonal and institutional objects of trust (Hetherington, 1998)¹.

Table 1. Trustee Types

Object of trust	Examples	
Another person	In IS	Interpersonal trust in organizational and e-commerce/e-business settings (McKnight et al., 2002; McKnight, Cummings, & Chervany, 1998); trust among members of virtual teams (Jarvenpaa & Leidner, 1999; Piccoli & Ives, 2003); trust between buyers and sellers (Ba & Pavlou, 2002; Pavlou & Gefen, 2004)
	In political theory	Citizens' trust in strangers or in incumbents of government positions (Job & Reinhart, 2003; Offe, 1999)
Artefacts	In IS	Internet shopping medium (Kim & Benbasat, 2003)
Person-technology combinations	In IS	Electronic auctions, e-vendors, e-government services (Gefen et al., 2003; Lim, Tan, Cyr, & Xiao, 2012)
Systems/institutions	In IS:	Third party certification of e-market transactions (Pavlou & Gefen, 2004; Shapiro, 1987; Zucker, 1986)
	In organizational theory/sociology	Social systems involving individuals enacting institutionalized rules and routines and sharing common meanings (Luhmann, 1979; Möllering, 2006b; Zucker, 1986)
	In political theory	Government organizations and organized political activities (Hetherington, 1998; Levi & Stoker, 2000; Warren, 1999)

A great deal of research in IS, organizations, and political studies has sought to identify the conditions, factors, and mechanisms that contribute to the production of trust. In general, these can be categorized as related to the characteristics of trustors (their general trusting disposition and/or rational and affective attitude to the object of trust), trustworthiness of the trustees, and enabling social context (see Table 2).

Specifically, IS research has proposed typologies and models either for specific phenomena involving trust (Pavlou & Dimoka, 2006; Warkentin et al., 2002) or for general trustor/trustee relationships (Gefen et al., 2003; McKnight et al., 2002; McKnight et al., 1998). In broad terms, such research attributes the production of trust to the following categories: perceived trustworthiness of the trustee (for example personal qualities such as benevolence, integrity or ability), general disposition of trust or suspicion towards humanity or technology (personality-based trust), cognitive or affective characteristics of the trustor related to the specific object of trust (cognitive or emotional trust), and institutional enablers (situational normality or structural assurance provisions, such as customer feedback mechanisms and escrow services).

¹ The political trust index combines citizens' feelings about the incumbents of government and public administration positions (for example citizens' opinions on whether people running the government are crooked) with institutional assessment (for example efficiency of public services or effectiveness of the courts of justice) and policy considerations (for example, environmental policy or foreign policy).

In institutional organizational theory, Zucker's (1986) seminal study of trust development in the U.S. economy identified three mechanisms of trust production: past experience of trustor/trustee interaction in their environment (process-based trust), characteristics of trustees and trustors (characteristics-based trust), and formal social structures of the economy that give rise to common expectations and understandings (institution-based trust). These categories have been recurrent in studies of trust across sociology and organizational theory and several theorists have sought to unpack and explore them. For example, trustors' past experience has been studied as a matter of familiarity (Luhmann, 1988) and as a knowledge-creation process (Lewicki & Bunker, 1996). The characteristics of institutions that engender trust include rules, routines, professional roles, and control functions (Giddens, 1984; Luhmann, 1979; Möllering, 2006b). The relationship between trustors, trustees, and the broader social context in which they are embedded reflect the more-general concern of these fields with issues of structure and agency. For example, structural accounts of trust have suggested a processual perspective of "active" trust creation by socially embedded trustors and trustees (Giddens, 1991, p. 96; Möllering, 2006b; Sydow, 2006).

In political theory, the production of trust in political institutions has been debated mainly from two perspectives. The first perspective considers trust in the institutions of government to be a culturally formed character trait of citizens, which emerges from the social trust that individuals form in their lives towards strangers and collectives of strangers in their communities (Putnam, 2000). From this perspective, trust in government institutions results from a historically developed predisposition in citizens to trust others in a society. However, critics argue that, in complex societies, trust in government institutions does not result merely from face-to-face, community-based relations (Giddens, 1990; Newton, 1999; O'Hara, 2004; Warren, 1999). There is little evidence that high-trust societies trust political institutions (Fukuyama, 1999). Moreover, to the extent that political trust is related to interpersonal trust, the causality may follow the opposite direction; that is, interpersonal trust may be a product of trusted democratic institutions (Muller & Seligson, 1994; Warren, 1999).

An alternative perspective associates trust in the institutions of government with citizens' expectations and perceptions of their performance, the performance of those responsible for their administration, and their outcomes (Mishler & Rose, 2001). In such theories, the study of political trust focuses on citizens' perception of the trustworthiness of institutions (Hardin, 2002; Levi & Stoker, 2000). Trustworthiness of a political actor (whether individual or institution) is understood to comprise two dimensions: motives underlying a commitment to fulfill the actor's political role responsibly, and competence in fulfilling this commitment (Giddens, 1994; Levi & Stoker, 2000).

It should be noted that research on trust has drawn a distinction between trustworthiness as a set of properties possessed by the trustee and perception of trustworthiness. Citizens' perceptions of a political actor's trustworthiness properties are not an accurate reflection of the actor's properties compared with expert or third-party assessments. Political institutions may be considered trustworthy on the basis of technical criteria, such as efficiency and fairness, and not enjoy citizens' trust (Hardin, 2002; O'Neill, 2002). Citizens' trust that does not reflect the institution's trustworthiness may be either misplaced trust or unjustified suspicion and distrust.

Table 2. Production of Trust in IS, Institutional Organizational Theory, and Political Theory

Field	Categories of factors engendering trust	Sub-categories and supporting literature
IS	Trustworthiness characteristics of trustees	Of persons: benevolence, credibility, integrity, ability (Ba & Pavlou, 2002; Pavlou & Dimoka, 2006)
		Of IT-mediated entities (e.g. e-commerce or e-government internet sites): performance, technical competence, security mechanisms (Gefen et al., 2003; Lee & Turban, 2001)
	Trusting disposition of trustor	Personality-based trust in humanity (Gefen, 2000; Gefen et al., 2003; McKnight et al., 2002)
	Characteristics of trustors related to specific incidents of trust	Cognitive trust: trustor's accumulated knowledge of the trustee's behavior (Gefen et al., 2003). Past experience-based calculation of costs and benefits involved in a trustor/trustee relationship. (Gefen et al., 2003; Kramer, 2006a; Williamson, 1993)
		Affective trust: Refers to feelings of security and comfort about relying on the trustee (Komiak & Benbasat, 2006; Sun, 2010)
Institution-based trust	Situational normality (McKnight et al., 1998)	
	Structural enablers such as third party certification and feedback mechanisms (Pavlou & Gefen, 2004; Shapiro, 1987; Zucker, 1986)	
Institutional org. theory	Past experience of trustors	Process-based trust (Zucker, 1986); Familiarity (Luhmann, 1988); Incremental knowledge creation (Lewicki & Bunker, 1996)
	Features of systems and institutions creating perceptions of their trustworthiness	Control mechanisms (Luhmann, 1979); Professional roles at the access points of abstract social systems (Giddens, 1990)
	Institution-based trust	Formal organizations and socio-cultural context creating common expectations and understandings (Zucker, 1986)
	Active engagement of trustor and trustee in processes of trust development	Active trust (Giddens, 1991)
Political theory	Trusting disposition of trustor	Social trust: results from the embeddedness of interpersonal trust in social networks of communities; it is associated with the notion of social capital that is considered necessary for economic activities (Granovetter, 1985; Putnam, 2000; Uzzi, 1997)
	Perceived trustworthiness of institutions	Perception and judgment of the performance of political institutions; may involve perception of trustworthiness of individuals in their institutional role enactment rather than as independent persons (Warren, 1999)

Which of these bodies of literature and categories of theory are relevant and appropriate for a study of a phenomenon of trust primarily depends on the way in which the object of trust is conceptualized. In Section 3, I delineate e-voting and identify a theoretical perspective for its study as an object of trust, and develop a conceptual model of trust formation accordingly.

3. Framing the Research Question on Trust in E-voting

3.1. E-voting as an Object of Trust

E-voting refers to the use of electronic technology to register voters, perform voting, and produce the voting results. It is important to note that e-voting as an object of trust is a narrower domain of actions than "elections". Trust in elections entails judgement of the trustworthiness of a larger range of activities than voting, including candidates' political manifestos and campaigns (Moisés, 2006). It entails beliefs about the extent to which elections effectively guarantee the quality of the democratic regime (that is, whether they produce a government capable of safeguarding citizens' rights, realizing developmental goals, prudently managing public funds, etc). Trust in e-voting concerns more-limited expectations and perceptions regarding the extent to which the voting part of election is organized

and conducted lawfully and competently, and the extent to which the voting results are an accurate representation of citizens' preferences. Nevertheless, while not the focal object of trust in e-voting, trust in elections as a democratic process may be part of the sensitizing conditions for trust in e-voting, motivating citizens to vote and predisposing them to trust or distrust the electoral authorities and the technologies they mobilize.

At the core of the e-voting process is the casting of citizens' votes, which, in the e-voting case of Brazil, involves the use of electronic technology in voting stations². The process of voting involves two main categories of social actors: citizens in their voter role, and electoral authorities in their role of organizers and guarantors of the running of voting and production of voting results. Electoral authorities act according to legislation that regulates the preparation and conduct of an election process. In some countries, including Brazil, the electoral authorities are also responsible for working out such legislation and bringing it to parliament for approval. Their range of duties for organizing and carrying out the voting involves creating and maintaining registers of eligible voters, setting up voting stations where voting takes place, and equipping them with machines and staffing them with facilitators and overseers of the vote-casting. They also aggregate the votes from each voting station, produce the overall aggregate results for an electoral region (in local elections) or the country (in national elections), and calculate the results according to election legislation. Trust in the conduct of elections primarily concerns the citizens' judgement of the trustworthiness of activities performed by electoral authorities. Other actors, such as political parties and the media, may influence this judgement. The media, for example, influence citizens' attitude to e-voting with advertisements intended to familiarize voters with its technology and procedures. Although the electoral authority in Brazil is independent of political parties, the latter directly influence citizens' perception of the trustworthiness of the voting's conduct by endorsing or questioning the voting arrangements, and by accepting or challenging the election results.

The e-voting technology comprises a range of artefacts, including electronic registers of voters, machines at the voting stations that check the eligibility of individuals to vote, electronic ballot boxes, security techniques, automatic counting, and electronic communication of aggregate votes. The introduction of these technologies to the voting process also introduces the social actors (organizations and individuals) that contribute to their construction, maintenance, and operation. This includes the technology experts in the IT division of electoral authorities and other government departments, IT vendors, and IT service providers.

I therefore take e-voting technology to be an assemblage of artefacts, techniques, and human and institutional entities (Orlikowski & Iacono, 2001). Focusing attention on such a hybrid of technology and organizational actors is theoretically sound from a sociology of technology perspective that is based on the premise that no social system can be what it is without the technology artefacts it utilizes, and that no technology is a mere artefact since artefacts rely on supporting networks of other artefacts, humans, and institutions for their operations (Howcroft, Mitev, & Wilson, 2004).

Accordingly, in this research, I consider the object of trust to be the composite entity of the organization responsible for the conduct of elections and the technologies used to register voters, record the casting of votes, aggregate and communicate the results—the technologies themselves being a composite socio-technical entity of artefacts and humans/organizations on which the continuous development and operations of the artefacts rely. These two components—electoral authorities and technology assemblages—form interdependent constituent e-voting parts.

Thus framed, trust in e-voting is a case of trust in the socio-technical entity of a technology-mediated government organization. The activities of this entity are institutionalized in the sense of the sociological neo-institutionalist notion of formal organizations. Organizations are institutions, which means that they are governed by regulatory mechanisms, that their mission and practice acquire taken-for-granted validity, and that they are embedded in historically formed cognitive, cultural and

² Other forms of e-voting involve remote voting via the Internet. In Brazil, the Internet is used only to communicate aggregate results from counting centres to the states' and the federal electoral authorities.

power relations (Currie & Swanson, 2009; Powell & DiMaggio, 1991; Scott & Meyer, 1994). The electoral authorities that conduct the elections are normally organizations with the legal status of government agencies that are endowed with legitimacy as necessary components of the modern state to serve a mission widely understood as the essence of democracy. Therefore, I study trust in e-voting as a case of political trust formation through citizens' perception of an institution's trustworthiness. The research question I set out to investigate is how citizens come to trust the socio-technical e-voting institution.

A distinction needs to be made between the development of citizens' trust in a newly formed socio-technical entity (McKnight et al., 1998) and in subsequent repeated encounters with the socio-technical entity (Ba & Pavlou, 2002; Gefen et al., 2003; McKnight et al., 2002; Pavlou & Gefen, 2004). In the former, individuals make sense of a new situation and come to trust it (or not) without drawing on directly relevant prior experience. In the latter, prior experience forms a disposition to trust or suspicion. This distinction points to two research sub-questions: a) how citizens come to trust e-voting when it is first launched, and b) how citizens' trust in e-voting is maintained in recurrent conduct of elections.

3.2. A Conceptual Model of the Formation and Maintenance of Trust in E-voting

The review of the literature on trust in Section 2 suggests that, important differences of focus and theoretical approach notwithstanding, trust formation and maintenance is associated with three main categories of factors and conditions: characteristics of trustors, characteristics of trustees, and the context of their interaction. Kee and Knox (1970) capture these categories as a sequence of antecedents and consequences in an abstract model of the formation of trust or suspicion (see Figure 1.) Trustees can be either individuals or collectives, and associations between antecedents and consequences are general enough to accommodate processes at various levels of analysis. At the core of this model is the perception of the qualities of trustworthiness held by the object of trust (the trustee's motives and/or competence). The ultimate consequence of perceived trustworthiness is behavior that reflects trust; perception of trustworthiness is associated with three antecedent categories: previous experience, structural and situational factors, and dispositional factors of the trustors.

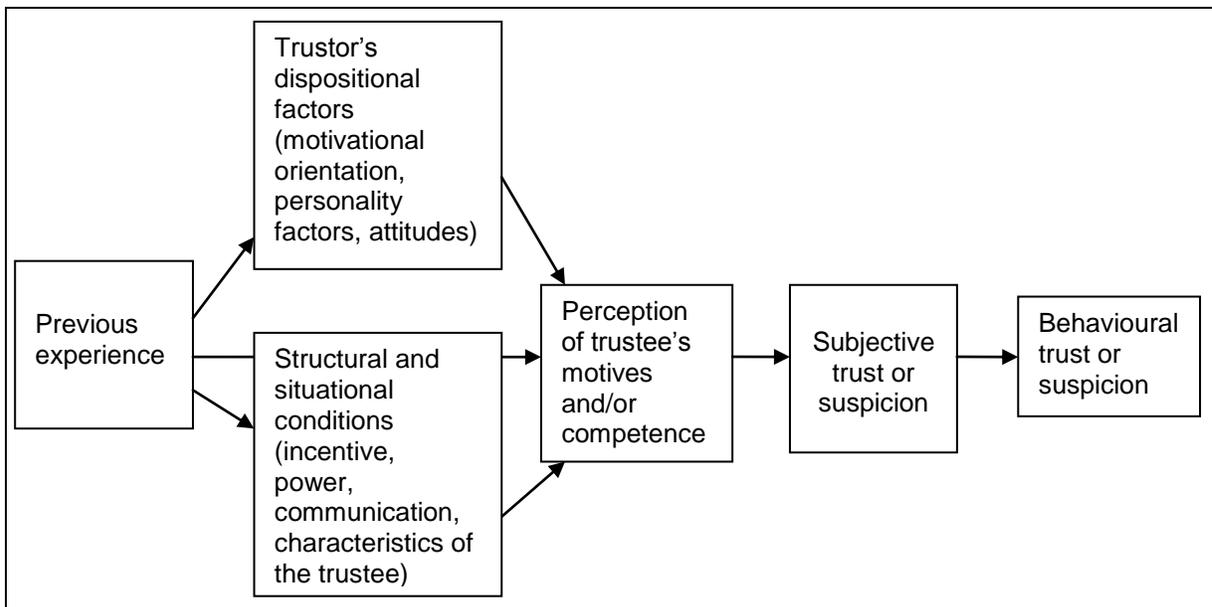


Figure 1. Conceptualization of Trust (Adapted from Kee & Knox, 1970, p. 361)

I take Kee and Knox's (1970) antecedents of trusting behavior as plausible categories configurable for specific phenomena of trust. Specific aspects of prior experience, dispositional factors, and situational conditions that are relevant for a trust phenomenon, such as e-voting, have to be empirically drawn. For example, research in political trust has found no relationship between personality dispositions and trust

(Levi & Stoker, 2000), but other dispositional characteristics, such as historically conditioned trust or suspicion in a country's democratic institutions, may be relevant in trusting e-voting.

For the purposes of this study on trust in e-voting, I omit the hypothesized intervening state of subjective probability or certainty about the trustee's trustworthiness, which reflects Kee and Knox's (1970) focus on cognitive psychological ramifications. In accordance to this model, I take behavioral clues as an indication of trust, and assume that trusting behavior results from the trustee's perception of trustworthiness in order to explain how such a perception is formed. Figure 2 shows Kee and Knox's conceptual model adjusted to guide the search for an explanation of trust in e-voting. The model depicts the composite entity of the electoral authority and the e-voting technology as the object of trust.

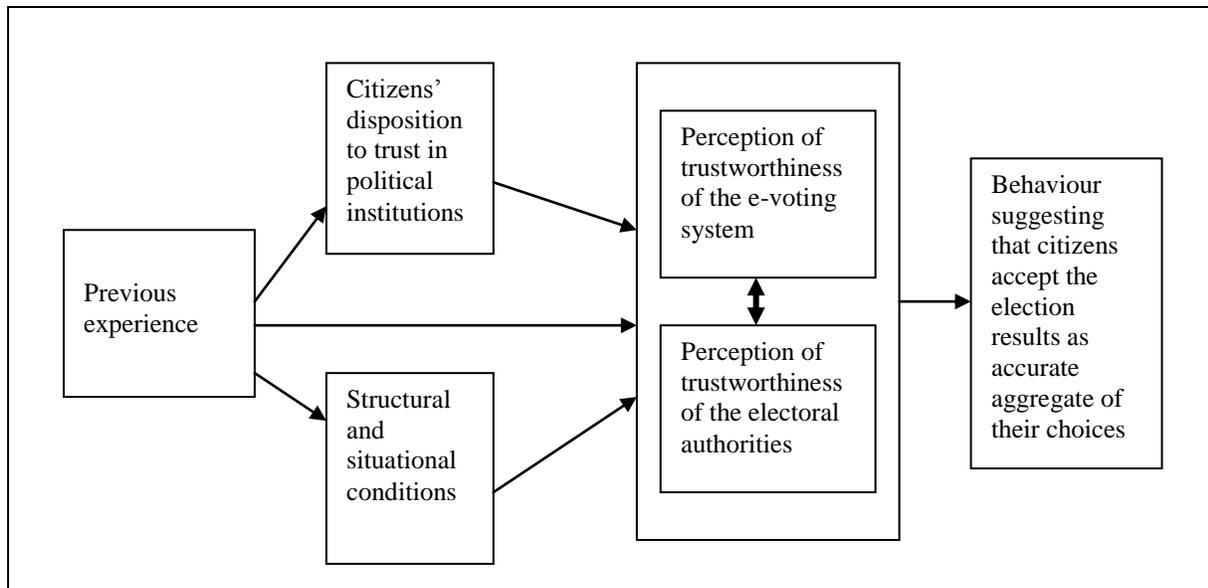


Figure 2. Trust Conditions And Relationships For E-Voting

To wit, in relation to the literature on trust I outlined in Section 2, this study's object of trust is the institutionalised assemblage of technology and a government organization. My research takes as its point of departure a conceptual model of antecedent and consequence associations among the common categories of conditions engendering trust across the IS, organizational, and political theory research fields, and identifies through a case study the instantiation of these categories in the phenomenon of trust in e-voting. In addition to identifying antecedent conditions (aspects of historical experience, of citizens' trust disposition towards the conduct of elections, and of socio-political context), I am interested in the causal processes that translate them to the perception of trustworthiness of e-voting. Causal processes are on the arrows that link the boxes of factors and conditions of the model on Figure 2, and my empirical and theory building endeavor aims to unpack these arrows and identify the actions and events they comprise.

3.3. Methodology

Explanatory theory identifies associations between an observed state of a phenomenon and conditions that influence its development. It also identifies the causal logic through which this influence happens (Gregor, 2006). The methodology I follow to explain trust in e-voting can be best understood with reference to Markus and Robey's (1988) analysis of theory and research in terms of three dimensions of causal structure (causal agency, logical structure, and level of analysis) that provides a comprehensive account of the different ways in which such theory is constructed in IS research.

"Causal agency" refers to assumptions made about the nature of agents of change. In IS research technology-enabled change is assumed to be caused by technology, or organizational actors, or their

interaction. These assumptions give rise to three research perspectives of IT and organizational change; namely, technology imperative, organizational imperative and emergent. My research is informed by the emergent perspective, according to which citizen's judgement of the trustworthiness of e-voting is shaped by complex and unpredictable social interactions. This methodological orientation toward the study of the unfolding interaction between the effects of technology and emergent action is consistent with the socio-technical understanding of e-voting, which I described above as election machines and techniques intertwined with electoral institutional actors (Avgerou, Ciborra, & Land, 2004; Bloomfield, Coombs, Knights, & Littler, 1997).

The "logical structure" of a causal theory distinguishes between variance and process research. Variance research forms causal propositions between variables of a phenomenon by testing their statistical association, while process research forms causal propositions for the observed outcomes of a phenomenon by tracing how actions and events have influenced their emergence. My study is process research that traces social mechanisms that bring about trust in e-voting. I consider social mechanisms to be processes composed of entities, actions, and events that produce change (Goh, Gao, & Agarwal, 2011; Gross, 2009; Hedström & Swedberg, 1998; Machamer, Darden, & Craver, 2000; Martin, Weisenfeld, & Bekmeier-Feuerhahn, 2009; McAdam, Tarrow, & Tilly, 2001; Merton, 1967). My analysis identifies actor constellations, socio-political events, and socio-political processes that give rise to the perception of trustworthiness of e-voting. It should be noted that the well-established process research tradition in IS does not usually identify causal relationships (Newman & Robey, 1992; Pentland, 1999; Sabherwal & Robey, 1995). The search for social mechanisms involves an explicit effort to unravel the causal logic that answers questions of how and why the outcome states of a socio-technical phenomenon occur (Avgerou, 2013).

The "level of analysis" refers to the entities that are the focus of analysis: individuals, organizations, or society. As Figure 2 indicates, I pursue a mixed-level analysis in which I assume that the formation of trust in e-voting involves the "dynamic interplay among individuals, technology, and larger social structures" (Markus & Robey, 1988, p. 596).

4. Research Method

I started this research with reputational clues I received from Brazilian friends and international organizations (such as the Inter-American Development Bank) that Brazilian e-voting is widely trusted (Avgerou, Poulmenakou, Ganzaroli, & Reinhard, 2009). It was pointed out to me that e-voting in Brazil has been regularly conducted smoothly, without disputes or controversies over election results.

I collected data on the Brazilian e-voting through various methods³. I drew extensively from secondary sources on the socio-political history of Brazil, its elections process, and the e-voting system. I held interviews with officials from the electoral authorities and with citizens at random. I conducted non-participant observation at the second round of municipal elections in Sao Paulo on 31 October 2004 and the first round of general elections for President, Senate, Federal Congress and States Government offices in Porto Alegre on 1st October 2006. I also observed the e-voting software sealing ceremony in Brasilia, September 2006, for the October 2006 elections. Table 3 shows a summary of these sources.

³ I started researching e-voting in Brazil as part of a research team, sponsored by the Inter-American Development Bank (IADB) to study the role of e-government in improving citizens' trust in the State in Latin American countries (2004-2005). The empirical research I present in this paper was designed to address, more specifically, the research question how was trust in e-voting created and sustained in Brazil. I use data that I collected in collaboration with some members of the research team (Avgerou et al., 2007; Avgerou et al., 2009) and additional data that I continued collecting on my own after the IADB project was completed, until November 2006.

Table 3. Data Sources

Place, time, duration	Interviews: Interviewees and subject of interview	Observations
Brasilia, Oct 2004, one day	Systems development team at TSE <i>Subject:</i> history of system development, process of system enhancement in between elections, system deployment process during elections	System demonstration
Sao Paulo Oct 2004, six days	Systems development team at TRE <i>Subject:</i> systems components, functionality, process of system enhancement and deployment for elections. Three TRE judges <i>Subject:</i> mission and structure of the TRE; legal/organizational process of elections; elections process, the history of e-voting; changes of the election process associated with the system; impact of e-voting on the tasks/role of judges overseeing elections. Presidents of the two precincts visited to observe voting <i>Subject:</i> Their duties, their perception of the system's security. Voters <i>Subject:</i> their experience of voting, their perception of the trustworthiness of elections, and of the election results; comparison with elections before e-voting was introduced; their perception of IT. Four journalists <i>Subject:</i> The trustworthiness of election results; the value of IT; the country's IT policies; the digital divide. Two political scientists <i>Subject:</i> current state of democracy in Brazil; process of the country's democratization; elections process; trustworthiness of e-voting; citizen's trust in government, politics, elections. Tree political party representatives <i>Subject:</i> trustworthiness of the e-voting system; Their involvement in the deployment of the system. Staff of Transparency International (NGO) <i>Subject:</i> political and electoral fraud in Brazil; trustworthiness of the e-voting system	<p>Voting for second round of state government elections, at two voting stations;</p> <p>Announcement of results at TRE headquarters</p>
Brasilia, Sept 2006, two days	Two judges at TSE <i>Subject:</i> the sealing ceremony; risks of electoral fraud; security aspects of the systems; amendments of the system since last elections Five political activists, critics of the system <i>Subject:</i> security vulnerability of e-voting in the context of Brazilian politics and institutions Staff of the Institute for Socio-economic Studies (INESC) (NGO) <i>Subject:</i> the state of the poor in Brazil; their attitude towards elections; perceptions of trustworthiness of the e-voting system	<p>Sealing of e-voting software;</p> <p>Launching of the book on the security of the e-voting by Brunazo Filho et al, at the city's central shopping centre.</p>
Sao Paulo, Sept 2006, one day	Two political scientists <i>Subject:</i> elections process; trustworthiness of e-voting; reasons of citizen's low trust in government, politics, elections; reasons of citizens' trust in the e-voting system.	
Porto Alegre, Oct 2006, five days	TRE technology staff <i>Subject:</i> system functionality, process of system amendments since last elections; system deployment process. Two precinct presidents <i>Subject:</i> Their duties, their perception of the system's security. Voters <i>Subject:</i> their experience of voting, their perception of the trustworthiness of elections, and of the election results; comparison with elections before e-voting was introduced; their perception of IT. Four TRE judges <i>Subject:</i> mission and structure of the TRE; legal/organizational process of elections; elections process, impact of e-voting on the TRE and the tasks/role of judges overseeing elections. Staff of the Jesuit mission (NGO working in a favela of the city) <i>Subject:</i> the value of elections for the poor; their political engagement; their interest in and value of IT; digital inclusion policy and provisions for the favela.	<p>First round of presidential and state government elections: pre-election system demonstration at TRE and one voting station; system installation and preparation at one voting station; parallel run of voting; elections at three voting stations; closing of the ballot; collection of votes at a regional collection centre; announcement of results.</p> <p>A favela neighborhood celebrating the election day.</p>

I collected data in order to form rich descriptions of the following:

- The institutional context of the elections. I used secondary sources on the Brazilian government system and the institutions responsible for federal and state elections. I also collected data on these institutions through interviews with government officials, electoral judges, and political scientists at the *Tribunal Superior Eleitoral* (TSE) in Brasilia and, at state level, with officials at *Tribunais Regionais Eleitorais* (TREs) of the state of Sao Paulo and the state of Rio Grande do Sul, in Porto Alegre.
- The legal/organizational process of preparing and conducting the elections. During the 2004 elections, I participated in a group of observers of the “system in action” in two voting stations of the state of Sao Paulo. During the 2006 elections, I participated in a group of foreign visitors at the *Tribunal Regional Eleitoral* (TRE) of the state of Rio Grande do Sul, in Porto Alegre, and observed the installation and preparation of the system in a voting station, the voting process in three voting stations, the “parallel run” testing of the system, the closing of the ballot, the collection of results in a regional results collection center, and the unfolding of the announcement of election results at the TRE.
- The e-voting system and the processes through which it was initially developed and subsequently updated in between elections. I interviewed IT experts and IT managers in the TSE and the two TREs I visited in 2004 and 2006.
- Views and feelings about the e-voting system, elections, and politics in Brazil. I interviewed voters at the voting stations and collected opinions from Brazilian citizens with whom I socialized during my research trips. Also, I interviewed one journalist, five activists campaigning against the system, and staff of Transparency International in Sao Paulo, the development NGO Institute for Socio-economic Studies (INESC) in Brasilia, and a Jesuit mission in a favela of Porto Alegre. With the help of staff from this Jesuit mission, I also conducted a questionnaire survey of the opinions and attitudes of the favela inhabitants. Their help included the random selection of 400 households and data collection by facilitators who visited them and completed the questionnaire forms. I collected 397 usable replies to a range of questions aiming to produce descriptive statistics of the extent of participation in the voting, the perception of the trustworthiness of results, and their use and perception of the value of IT.

The research method was interpretive single-case study. It involved two cycles of data collection for the formation and refinement of narratives regarding the processes of trust creation and maintenance in Brazilian e-voting. During the first data collection visit to Brazil in October 2004, I formed an overall view of these two focal processes from the stories of my interviewees, event observations, and system demonstrations. These stories had a focus on particular events and actions from the perspective of particular individuals' role, such as the IT staff narratives on the history of the system's development, the TRE judges' stories about the way the system contributes to fighting electoral fraud and empowers the poor, and journalists' cautious justification of the trustworthiness of the system, which indirectly conveyed the computer security concerns of some computer scientists and political activists. To associate the multiple partial stories from the field with the context of the country's unfolding politics and construct narratives for the overall processes, I also drew from secondary literature on the political history of Brazil and interviews with academics.

There was adequate congruence among the multiple stories about the important social actors (the TSE, the IT industry, the government organizations enacting digital inclusion policies), sequences of events (the e-voting pilots, the recurrent sealing of software), and actions (software enhancements in between elections, system installation and manual voting parallel run). By juxtaposing the actors, events, and processes that emerged from the stories-from-the-field with the conceptual model of Figure 2, I identified a tentative explanation of trust in the Brazilian e-voting in the form of two causal process models—one for the introduction of e-voting and the other for its recurrence—which I present

in some detail in Section 6. Two areas emerged as particularly crucial in understanding the explanatory processes and became the focus of my second data collection trip: the contentious issue of system security and the interpretation of trust behavior of voters in poor areas of the country.

In September-October 2006, I collected stories and views from activists against e-voting and sought to understand the grounds of their critique. I also interviewed more actors involved in the e-voting processes, such as TSE and TRE judges, precinct presidents, and individuals in various roles (voters, journalists, academics, NGO staff) who were quite content with the security features of the system. I complemented the data from interviews and observations with the survey I described above, which provided a snapshot of the attitude of a poor community toward e-voting and toward IT one week after the first round of the 2006 elections. With these data, I refined the initial narratives and the resulting explanatory theoretical model. I felt at that point that I had achieved adequate understanding of social actors, events, and processes to form a plausible plot of loose causal order (Pentland, 1999). In this paper, limitations of space allow me to present only a stylized summary of the narratives constructed in this research, in which I point out the most prominent social actors and the most seminal aspects of the introduction of e-voting in Brazil and the processes of its continuous fine tuning and enactment.

5. Case Narrative

5.1. The Political and Institutional Context of Brazilian Elections

Brazil is a Federal Republic with a President and a bicameral National Congress comprising a Senate and a chamber of deputies. The country had a turbulent political history in the 20th century and was under military rule from 1964 until 1985. The restoration of multiparty democracy started slowly in 1979 and the transition to popularly elected government was completed in 1989. A new democratic constitution was promulgated in 1988 after a year of negotiations at the Constitutional Assembly and extensive public participation. Among other changes of re-democratization, the constitution established extensive individual rights, including rights for illiterate citizens to vote (Flecha de Lima, 1999). It was in this political context of re-democratization efforts that the e-voting system was developed by the electoral authorities.

In Brazil, the electoral system is ruled by the judicial system. The institution responsible for the conduct of electoral affairs is the *Tribunal Superior Eleitoral* (TSE), a special court of the judicial system that was created in 1932 to put an end to electoral fraud and manipulation. It is composed of seven members, each with a two-year mandate. The TSE regulates the functioning of political parties and oversees all aspects of elections. Its power includes granting or canceling parties' registration, registering candidates and certifying those elected, revising and proposing the electoral law, supervising party conventions and internal elections, regulating and supervising party access to free television and radio time during an election, and registering voters. The law that regulates the elections process in Brazil is revised every two years, in correspondence with a new cycle of elections. It is the TSE's responsibility to draft a legal resolution and submit it to the legislative power for approval. The TSE is a mighty institution with autonomy in the management of the electoral process and a reputation of competence. Indicatively, the content of the legal resolutions they draft is rarely debated by the legislative.

The Regional Electoral Courts—the *Tribunal Regional Eleitoral* (TRE)—are responsible for managing elections. Each court comprises three judges on secondment from the State Court of Justice. Each state is divided into electoral zones, and, in the 2006 elections, there were 3,073 electoral zones in the country.

5.2. E-voting System: A Brief History of its Development

In 1986 the TSE started computerizing the electoral system with the development of the voters' central database (the National Registry of Voters). The objectives were to improve the reliability of the registration process by preventing voters from registering in more than one local registry, to increase

the efficiency of the registration process, and to electronically connect the TSE with the 27 TREs and the 2,900 precincts of the country. A more-ambitious objective of the TSE was to automate the counting process, and this was accomplished in 1994. Votes were counted manually at precinct level and reported to the local Electoral Committee, then converted to electronic format and transferred, via encrypted transmission, to the counting server hosted at the TSE. The introduction of this electronic counting system was considered by the TSE and political observers as a decisive step towards increasing the accuracy of the counting process and reducing fraud.

These initial successes convinced the TSE that further improvements were possible by extending the application of electronic means to the elections process. At the beginning of 1995, the TSE, using World Bank funding, formed a task force to that end comprising members of its staff and staff from the TREs. The task force focused on two major objectives. The first was to stop fraud—mainly to put an end to the practice of buying votes, which was common in some areas of the country. The second was to strengthen political participation and inclusion by simplifying the voting system.

Within six months, the task force sent a proposal for the development of a computerized ballot box to all TREs, political parties, and ministries, and invited IT experts from federal ministries to participate in the specification of hardware and software requirements. This invitation was accepted by five ministries with substantial IT capabilities and, in September 1995, the project for the e-voting system was launched, engaging a group of fourteen IT specialists. In May 1996, the first electronic voting machine and its software were completed. The system was first piloted at the municipal elections of October 1996 in all cities with more than 200,000 voters and all state capitals, involving 33 percent of the voters. A second pilot was run at the general elections of 1998 at all cities with more than 40,000 voters, reaching 67 percent of the voters. The system was used in the whole country at the municipal elections of 2000.

The voting machine has two linked terminals installed in each voting station. The first terminal is used by a representative of the precinct board to identify the voters. The second terminal is a Direct Recording Electronic device (DRE)⁴ that the voters use. The voter types in the identification number of their candidate of choice and the screen shows the candidate's name, initials of the party or coalition the candidate belongs to, and the candidate's photo. The voter presses the "enter" key to confirm or the correction key to re-start the process. The terminal also has a key for a blank vote.

The voting machine saves its data on a diskette in an encrypted format. The system audit program, loaded on all voting machines, records and time stamps all transactions, including the initialization and the casting of each vote, machine down-times due to power failures, and print-outs requested. The system security program prevents any tampering with the machine such as the removal of the diskette on which votes are stored. Any such action would result in the machine shutting down.

5.3. Elections Process

Elections take place in October. In December of the year before the elections, the TSE submits to the parliament a draft resolution to update the electoral law. The resolution also identifies software changes needed to enact the law into a new version of the e-voting system. Within a month, the TSE revises the system according to the requirements specified in the approved resolution. The software development is completed 180 days before elections. The source code amendments are then made available to IT experts of political parties to check whether the system complies with the law approved by the parliament.

Sixty days before the elections, the software is "sealed" during a public "ceremony", in which political parties and representatives of civil societies are invited to participate. In the 2006 elections I observed, software amendments were signed by major political parties' representatives, by the Bar associations' representatives, and by the Federal Prosecutor. During this event, a sequence of tasks takes place. The first is the generation of "hash function tables", which are used to prevent the software's source code from being modified. The second is the digital signing of the compiled version of the software

⁴ See http://en.wikipedia.org/wiki/Electronic_voting#Direct-recording_electronic_.28DRE.29_voting_system for a description of the technology.

code. Hereafter, authorized political party representatives, using their digital signature, can check the integrity of the software that is uploaded in any e-voting machine. The third task is the encryption of the software, which is then distributed to the TREs.

A few days before the elections, each TRE loads the e-voting machines with candidate information (name, number, party or coalition abbreviation, and photograph), precinct voters' data, and software applications. Representatives of the political parties are required to attend this loading process. A validation test is made on a sample of three per cent of the overall number of e-voting machines, randomly selected by the representatives. The day before the elections, the e-voting machines are put in place. A percentage of these machines are taken back to the TRE for a reliability test by a simulation of a voting session. If no malfunctioning is detected, each machine must be back at the precinct before 7.30 a.m. of the election day.

The president of the voting station turns on the e-voting machine at 7.30 a.m. in the presence of party representatives. The machine automatically prints out its first report, called "zerésima", to prove that the ballot box is empty. This document is signed by the "identification officer" and party representatives and is enclosed in a packet for the documentation of the precinct.

At 5pm on the election day, the president of the voting station uses their password to close the voting machine and to print the "voting machine report". The report contains identification information for the precinct and the voting machine, the number of those who voted, the number of votes for each candidate, and the number of blank and spoilt votes. It is printed in five copies, which are signed by the president of the voting station and by the representatives and inspectors of the political parties. One copy is displayed announcing the results of the precinct and another copy is delivered to a political parties committee to allow parties to check whether the data have been modified during transmission. The encrypted diskette with the votes and three copies of the voting machine zerésima and end-of-the-day reports are enclosed in the precinct's documentation and sent to the local Electoral Committee—usually located at electoral registry offices, or regional courts—for vote counting and tallying. In the case of municipal elections the total-added votes from all precincts of a municipality are then transferred to the local TRE. In the case of general elections, the data of the precincts are transmitted both to the local TRE and to the TSE.

5.4. Views About the Trustworthiness of the E-voting

Opinion surveys and behavior indicators suggest that Brazilians in general trust their country's voting process. A survey of citizens' trust in institutions conducted by non-governmental agencies⁵ in 2004 showed that 81.5 percent of the respondents had full or partial confidence in the Electoral Justice institution, with 89.5 percent of them positively judging the services it provided, and 96.7 percent positively judging the speed of votes counting. Nevertheless, survey data on citizens' satisfaction with government services are not reliable indicators of their perception of trustworthiness and consequent trust, and need to be considered together with behavioral signs of trust or suspicion (O'Hara, 2004). In this respect, it is important that disputes over results have been very rare, even in cases where the votes gained by competing candidates were close, and no incidents have occurred challenging the validity of the vote counts.

From my observation of two election episodes, voters seemed to appreciate the problem-free experience of voting. The fast and un-crowded voting experience created a relaxed atmosphere at the voting stations I visited. Many parents took their young children with them to the voting booth to show them how they use the machine to vote. The use of the voting machine was part of school education and television publicity in the elections period. In the 2006 elections, this calm celebratory atmosphere around the voting experience was in stark contrast to the climate of allegations of corruption of politicians and political parties throughout the elections period. Amid preoccupation with scandals concerning government incumbents and the contestants of representative democracy, the voting part of the elections process was conducted without any indications of citizens' suspicion.

⁵ TV Cultura and the Nexus Institute.

The judges I interviewed pointed out that they do not now spend time at voting stations overseeing the voting and concentrate their attention on other potential types of electoral fraud, such as political parties influencing voters at the vicinity of the voting stations. Many interviewees noted with appreciation that the speed of the announcement of the election results increased dramatically. Indicatively, in the 2004 municipal elections, 99 percent of the votes (more than 100 million votes) were counted within five hours of the closing of the voting stations.

However, the security of e-voting was a contentious issue. Several computer scientists, political scientists, journalists, legal experts, and a small political party have voiced concerns about the risks of technology malfunctioning and fraud⁶. Central among their concerns was the lack of a paper log of votes, a criticism frequently voiced about DRE systems (Kohno, Stubblefield, Rubin, & Wallach, 2004). The TSE amended the initial system to record and produce an electronic log of individual votes (in random, in order to maintain the anonymity of voting), but the totally electronic form of the votes precluded resorting to the counting of votes recorded on paper in case of a dispute. There were also concerns about the limited auditing allowed prior to the elections. Complaints included the testing of only software amendments and not the whole system by parties' representatives and other interested individuals, and the proprietary operating systems of some of the machines. Moreover, the identification of voters at the voting station was considered unsatisfactory. This last point was the only concern the TSE acknowledged as valid and set out the implementation of electronic means of voters' identification, such as checking of fingerprints, for the 2010 elections. The TSE considered the printing of votes to be a source of inefficiency and, potentially, fraud⁷. They also argued that restrictions of the auditing process prior to the elections were necessary precautions against external interference with the system because allowing hands-on testing of the system could open possibilities to alter the software code.

In effect, experts considered the security of the electronic voting system to be robust in terms of preventing external fraud (though not un-breachable), but it was vulnerable in its heavy reliance on the guardian authorities, the TSE and the TREs. Indicatively, in addressing requests for strengthening the technical means and auditing procedures for the security of the system, the TSE replied "the guarantee of the security of the electronic elections is us"⁸.

6. Mechanisms of Trust in the Brazilian E-voting

How can we explain the behavioral indication of trust in the Brazilian e-voting system? Surely not by the objective features of trustworthiness of its technology. Indeed, the country's lack of election result contestation and expressions of suspicion is all the more paradoxical given the publicised concerns of technology experts. At the day of the sealing ceremony of the 2006 presidential elections, a group campaigning against the e-voting system⁹ on the basis that it is insecure was launching its book (Brunazo Filho & Cortiz, 2006) at the shopping centre of Brasilia and I visited their kiosk. There was remarkably little response from the public.

In this section, I seek an explanation for the trusting behavior of Brazilian citizens in relation to e-voting within events and processes occurring in its organizational and socio-political context. I differentiate between the initial creation of trust in e-voting, which comprises the stage up to the first countrywide use of the e-voting system in 2000, and the maintenance of trust in the conduct of elections since then.

⁶ See, for example: <http://www.votoseguro.org>; (Rezende, 2004 ; Brunazo Filho & Cortiz, 2006).

⁷ In 2009, the Brazilian legislature approved the use of printed ballots, which are planned to start in 2014.

⁸ From an interview with a political scientist, activist of "voto seguro".

⁹ <http://www.votoseguro.org/>

6.1. Initial Trust Creation

6.1.1. The Process of Democratization

Of crucial significance in the Brazilian e-voting case seems to be the historical roots of this innovation at the restoration of democracy. The authoritarian regime that resulted from a military coup in 1964 justified itself as a defender of democratic order and did not abolish elections. However, political parties were banned and citizens' choice was restricted to a bipartisan system of politicians supporting the military regime and an opposition movement. Electoral reforms were introduced at that time to favour the formation of pro-military government (e.g., by restricting political publicity and by rules that secured increased representation of the northern states in which the regime had more support). Political parties were allowed in 1979, but the military resisted change and continued to manoeuvre electoral reforms that favoured the party representing it (Flecha de Lima, 1999). Civilian rule was restored in 1985 with the election of a president supported by an alliance of moderate politicians from right and centre parties.

The shaping of the e-voting system was closely associated with the efforts by political parties and the State to increase citizens' effective participation in elections. The first significant event to that end was the amendment of the constitution in 1985 that aimed to extend political rights to the whole population and gave illiterate citizens, estimated at that time to be close to 30 percent of the population, the right to vote¹⁰ (Power, 2009). With the inclusion of the illiterate in the electoral register and improvements in education, the turnout at the 2000 elections reached 94.6 percent of the voting-age citizens (Limongi, 2006). But a high proportions of citizens who went to the polling booths did not really vote. In the 1990s elections, 40 percent of the votes were invalid (they were either blank or null). It is not straightforward to interpret what blank and null votes signify. In general, blank votes may be cast deliberately as a protest or they may indicate apathy to the elections; they may also result from inability of voters to handle the voting method (Power & Roberts, 1995). In this case, political analysts explained blank votes mainly as an indication of apathy that had its roots in the period of the military regime, and suggested the need for mobilization of the electorate by political parties and civic engagement. However, null (or spoilt) votes that were not counted were taken as a clearer indication of citizens' difficulty to cope with the complicated ballot papers of the re-democratization period (Limongi, 2006).

The electoral system of Brazil, which is a combination of majoritarian and proportional representation, produces highly complex ballots. The opening up of the elections to many parties and the country's multi-layer government system increased the complexity of the ballot paper and exacerbated the inability of the illiterate and semi-literate to make clear their candidate preferences¹¹. The paper-voting method involved long lists of candidates' names and required voters to write on the ballot paper the names of their preferred candidates. This created further problems at the counting stage, as counters had difficulty interpreting hardly legible writing to account for voters' preferences and many votes were deemed spoilt and discarded.

Several changes to the electoral rules addressed the problem of the complexity of the ballot paper with the aim to increase effective citizen participation in elections. For example, to make it easier for voters to identify their preferred candidates, in 1986, a law required ballots to show the identification of parties by their symbols and colours and voting stations to post named photographs of candidates. To reduce the number of null votes, another law set guidelines for interpretation in votes counting, stating that "inversion, omission or spelling errors in the surname or name will not invalidate the vote, provided it is possible to identify the candidate" (Law no. 8037, 1990, May 25). Invalid votes started decreasing in the 1994 elections. A number of plausible explanations of this trend have been proposed by political analysts, including the consolidation and smaller number of political parties and a simpler ballot paper.

¹⁰ Mandatory for those literate and over 18 years old; voluntary for 16-18 years old and the illiterate.

¹¹ For example, there were nearly 650 candidates in the 1990 elections for the Chamber of Deputies in Sao Paulo. Such long lists of names did not fit on ballot papers, which is why voters had to write the name of their preferred candidate (Power & Roberts, 1995).

It is in this context of sustained effort to increase effective participation in elections that e-voting was proposed, developed, and deployed by the TSE in the 1990s. Analyses of the downward trend of invalid votes suggest that e-voting enhanced the ongoing process of expanding political inclusion that started with the constitutional reform of 1985. Indicatively, areas that used e-voting in 1998 had a significantly larger drop of invalid votes in comparison to those which did not use it yet. In the former, null votes were reduced from 27.2 percent to 4.9 percent; in the latter they were reduced from 22.3 percent to 17.0 percent. This latter group achieved a similarly large drop of null votes, from 17.0 percent to 2.6 percent in 2002, when they introduced e-voting (Limongi, 2006). In such a dynamic context of democratization and enfranchisement, perceptions of trustworthiness of the way elections were conducted should be understood as a judgement of relative improvement rather than the absolute measure of particular aspects of their quality.

Several social actors influenced the citizens' perceptions of the voting trustworthiness. Political parties supported the e-voting system. So did human rights NGOs, who have been vocal actors in Brazil, particularly on issues of transparency and empowerment of the poor. The media too have been an important source of influence on citizens. They often spread mistrust through uncovering scandals and wrong-doing of political institutions, but, in this case, they spread the message of voting as a "right" and engaged with the effort to inform citizens about where and how to vote. Crucially for this case, all these actors were positively predisposed towards the modernization of elections through IT.

6.1.2. Creating a Positive Attitude Towards IT

Since the 1970s, the Brazilian Government has pursued policies to promote IT capabilities as a force for development, and fostered a positive public attitude to IT. Following Leidner and Kayworth (2006), I call this attitude an IT culture. Differences of attitude towards IT have been found among organizations (Kaarst-Brown & Robey, 1999) and among countries. For example Weil and Rosen's (1995) study of anxiety, cognition, and attitudes toward computers of university students from 23 countries explained the lack of technophobia in terms of a culture that values technology, uses IT from an early age in education, and has a supportive political climate. Brazil's supportive policies date back to the mid 1970s, when the then-nationalist military government identified the computer industry as one of the key sectors for the industrialization of the country and subsidized Brazilian companies to invest in computers. As a result of such policies, the country made an early start in the production of IT and pursued sustained computerization efforts in all industries, despite its crises of economic and political instability (Adler, 1988; Evans, 1986; Evans, Frischtak, & Tigre, 1992; Tigre, 2003). Government computerization tapped into and further contributed to the development of local IT expertise (Lau, Aboulhosen, Lin, & Atkin, 2007)¹². During the period of hyperinflation of the 1980s, Brazilian banks introduced IT that was advanced for that time, such as ATMs, which familiarized citizens with IT as a trusted facilitator of services (La Rovere, 1996). At the time of the introduction of the e-voting system in the late 1990s, middle-income Brazilians were making extensive use of electronic payment systems and e-commerce was taken up rapidly¹³. People came to expect similar convenience from their transactions with the government sector.

6.1.3. The Interdependence of the Electoral Institution (TSE) and Electronic Technology

From the conception of the idea for an IT system of voting by the TSE, the organizational and the technology systems came to rely heavily on each other for their survival and reputation. The e-voting system was conceived by the TSE in the 1980s, and served its aspirations to secure its credentials as a democratic institution, independent of political parties and the government of the day, at the post-military democratic regime. Successful development of the e-voting system and its deployment in efficient and problem-free elections enhanced its competence reputation. Moreover, the perception of the e-voting system as a mechanism that enabled voting rights, enhanced its image as an institution committed to extending democratic participation. The success of the technology has much to do with the ability of the TSE to manage a multi-technology project, the staging of the two pilots, and the rolling out of the system to even the most remote parts of the country. By developing the technology

¹² The e-voting system itself (hardware and software) has been developed with indigenous expertise and, at the time this research was conducted, there were deals to sell it to other Latin-American countries interested in adopting electronic elections.

¹³ 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>.

in-house with the support of local industry and other government departments, the TSE kept the ownership and maintained control and responsibility for the system.

At the same time, citizens' perception of the trustworthiness of the e-voting innovation was related with their perception of the TSE's motives for introducing it. To the extent that the declared motives of fairer elections were accepted as legitimate and truthful, the system itself was perceived as a trustworthy arrangement for voting. This interdependence was institutionalised by legislation when the TSE successfully introduced technology-driven electoral process reform. The conduct of elections became a techno-organizational institution with the e-voting technology and the electoral organization mutually reinforcing each other's perception of trustworthiness.

6.1.4. A Model of the Development of Trust in the Brazilian E-voting

Figure 3 adapts Figure 2 to depict the conditions of trust creation for e-voting in Brazil, and the events and processes that brought about perceptions of trustworthiness in this case.

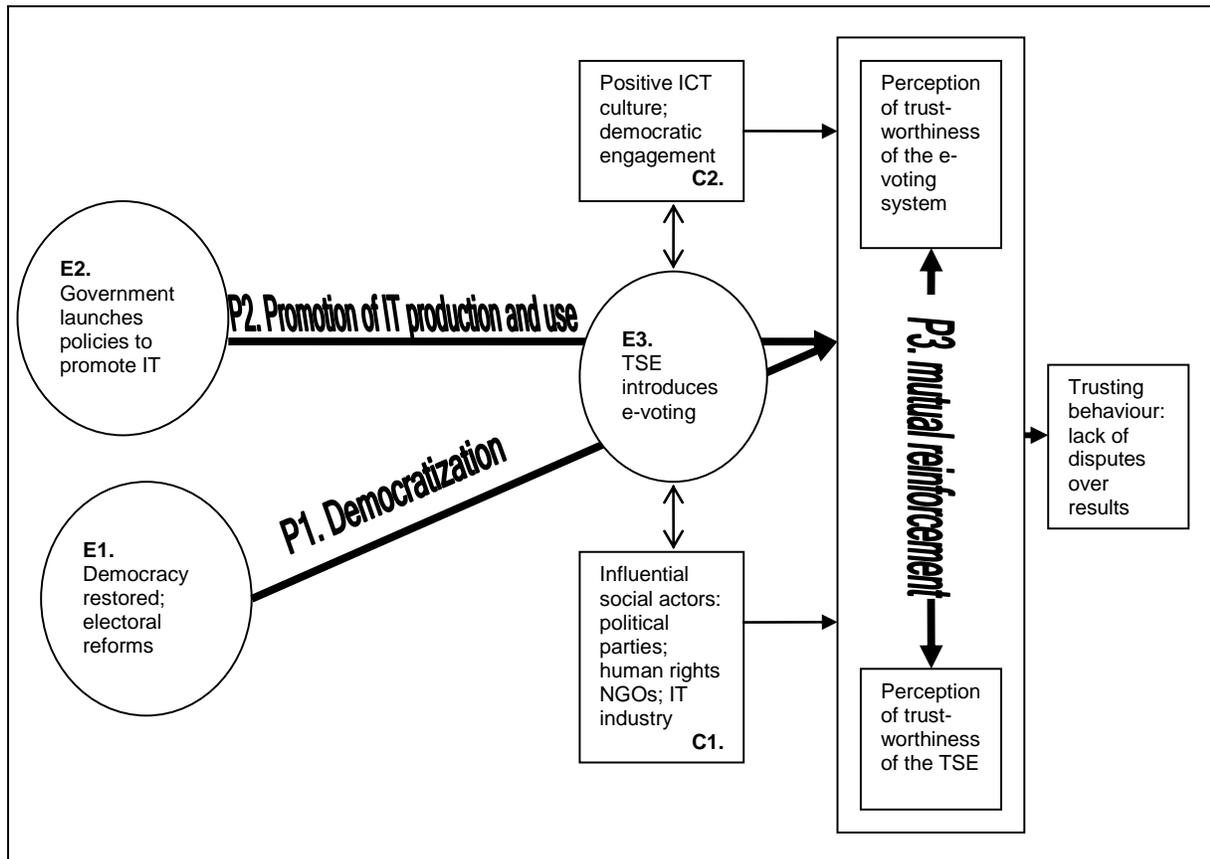


Figure 3. Initial Formation of Trust in the Brazilian E-voting

The boxes in Figure 3 depict the dispositional and structural conditions that emerged as relevant in this case study: C1 refers to structural and situational conditions, and, in this case, it comprises the main categories of social actors that influenced perceptions of trustworthiness. C2 refers to the trustors' dispositional conditions, and it comprises the existence of positive IT culture and democratic engagement.

The causal mechanisms that explain how citizens came to trust e-voting are formed from the combinations of events and processes, shown in Figure 3 as circles and bold arrows. The circles depict three clusters of events:

E1 refers to the restoration of civilian rule in 1985 and the political and legal reforms that aimed at enfranchising the whole of the population. These include the act that lifted voting restrictions for illiterate citizens and subsequent electoral reforms to simplify the ballot method and reduce votes taken to be spoilt during counting.

E2 refers to the launching of government policies that contributed to Brazil's IT capabilities and IT culture. Most important among them were the policy for industrial self-sufficiency and independence from computer multinationals formed by the nationalist regime of the mid-1970s, which fostered the development of domestic hardware and software industry, and the liberalization of the computer industry in the early 1990s, which shifted emphasis from production to effective use of computers and the creation of a domestic market of IT services.

E3 refers to the development of e-voting technology, its piloting in 1996, 1998, and 2000, and its deployment in all voting stations of the country in 2002.

The bold arrows depict processes:

P1 refers to the efforts of multiple political actors to restore effective elections after the restoration of democracy. These involve efforts by the TSE to include the illiterate population in the electoral registers and to raise the level of education across the country; by political parties to mobilize the electorate; by NGOs, political activists and journalists to create awareness on political rights of citizens in poor communities and bring an end to buying votes from the poor. This process is a constituent part of the re-democratization effort to enhance enfranchising, and has thus contributed to the perception of e-voting as a trustworthy innovation of the country's political institutions.

P2 comprises actions by various government and private sector actors to promote IT in the economy and public services. This process resulted in the development of substantial IT capabilities in government IT centres, a vibrant IT services industry, and a widespread positive attitude towards IT as a modernizing force. It contributed to the TSE's aspiration and confidence to undertake the development of an electronic voting system and created domestic skills for the development of the hardware and software of the system. The events of the successful pilot trials and eventual country-wide use of the indigenously produced electronic voting system boosted the positive public perception of IT and the reputation of the Brazilian IT industry.

P3 refers to the mutual reinforcement of the trustworthiness of TSE as a government organization and e-voting as a socio-technical system. By developing successfully the e-voting system the TSE strengthened its reputation of competent custodian of elections. By being deployed by the TSE, the e-voting technology enjoyed its security guarantee and came to be seen as a modernizing force in democracy.

6.2. Trust in Recurrent E-voting Episodes

6.2.1. Embedding E-Voting in Democratic Institutional Processes

A range of activities for the preparation of e-voting, from the legal resolution for technology-centered changes of the voting process to the implementation of system enhancements and the deployment of the system, contributed to maintaining trust in recurrent episodes of e-voting. Approval from parliament and the legal requirement of participation of multiple social actors in the ongoing fine-tuning of the system and its enactment are activities designed to create political legitimacy and demonstrate trustworthiness. A well-organized and much-publicized process of software enhancements prior to each episode of elections, invitations to political parties and other social actors to participate in test procedures, security tests such as removal from random voting stations and testing of a number of machines, the parallel runs of paper ballot and e-voting, all contributed to reminding citizens of the continuous care given to ensure trustworthy elections. Political institutions, the IT industry, the media, and civil society were mobilized in a process of active trust formation in a complex socio-technical system (Giddens, 1990).

6.2.2. Cultivating an IT Culture Across the Country

In the period of using e-voting, from 2000 onwards, a discourse on digital inclusion has been prominent in Brazil and cultivated perceptions of IT as a major vehicle for prosperity. Federal, state, and municipal governments and NGOs have been making sustained efforts to provide access to IT in poor communities throughout the country (Benson, 2005), spreading the belief that IT is *sine qua non* for inclusion in the modern economy. By the time of this study in the mid-2000s, there were layers of IT infrastructure in most of the Federal and State Government agencies, giving citizens electronic access to businesses and banks, and offering an increasing range of Internet-based public sector services to citizens. A virtuous circle of IT was set in motion: government services, schools, television and community telecentres created a perception of necessity and adequate familiarity with IT that sensitized citizens to see the electronic ballot box as the “natural” interface of voting. And through the perception of e-voting as a trustworthy way for conducting elections, IT further gained in popularity as means used by all, rich and poor, to modernize the state, boost the economy, and facilitate democracy.

The view that IT is a modernizing and facilitating means for government and the economy was shared by all our middle-income Brazilian interviewees. I also explored beliefs on IT in the survey I conducted in a favela at the outskirts of Porto Alegre. Only 25.7 percent of our population sample used computers, which is not unusual for poor communities in the world, but 78.6 percent of the respondents believed that computers are very important and suggested a variety of justifications for this belief, including finding a job, accessing government services and benefits, and socializing.

6.2.3. Continuing Intertwining of the TSE and E-voting in a Socio-technical Entity

The mutual reinforcement of the perception of trustworthiness of the electronic system and its hosting government agency continues to be a central mechanism for maintaining trust in the voting arrangements of elections in Brazil. While the e-voting system has contributed to the perception of Brazilian elections as an efficient and fair exercise of a political right, it relies on competent overseeing by the TSE. The system has been believed to be trustworthy to the extent that the TSE has been believed not to abuse its power. The TSE, already very powerful in Brazilian politics¹⁴, has boosted its legitimacy by modernizing elections through a domestically produced trustworthy technology that was highly praised internationally and, at the time of the research, was transferred to other countries. At the same time, its own trustworthiness has continued to be a necessary element for guarding the fraud-free use of the electronic system.

The extent to which technical experts' reports on the risks inherent in the system and voices of concerned political activists influence trust in the conduct of elections depends on citizens' perceptions of the TSE's ability and willingness to act as an effective guarantor against action compromising the functioning of the technology. In other words, while at the time of the research the perception of a benevolent and powerful electoral authority seemingly compensates effectively for the awareness of security weaknesses of the technology system, the perception of the trustworthiness of e-voting will be challenged if the all too powerful electoral agency is judged as non-trustworthy for any reason. In such a case, the mutual reinforcement of trust in the electoral authorities and the technology might become mutual reinforcements of mistrust.

Figure 4 adapts Figure 2 to the conditions that sustain trust in e-voting in Brazil, showing the processes that contribute to maintaining perceptions of trustworthiness.

¹⁴ The TSE both regulates elections and enacts its regulations.

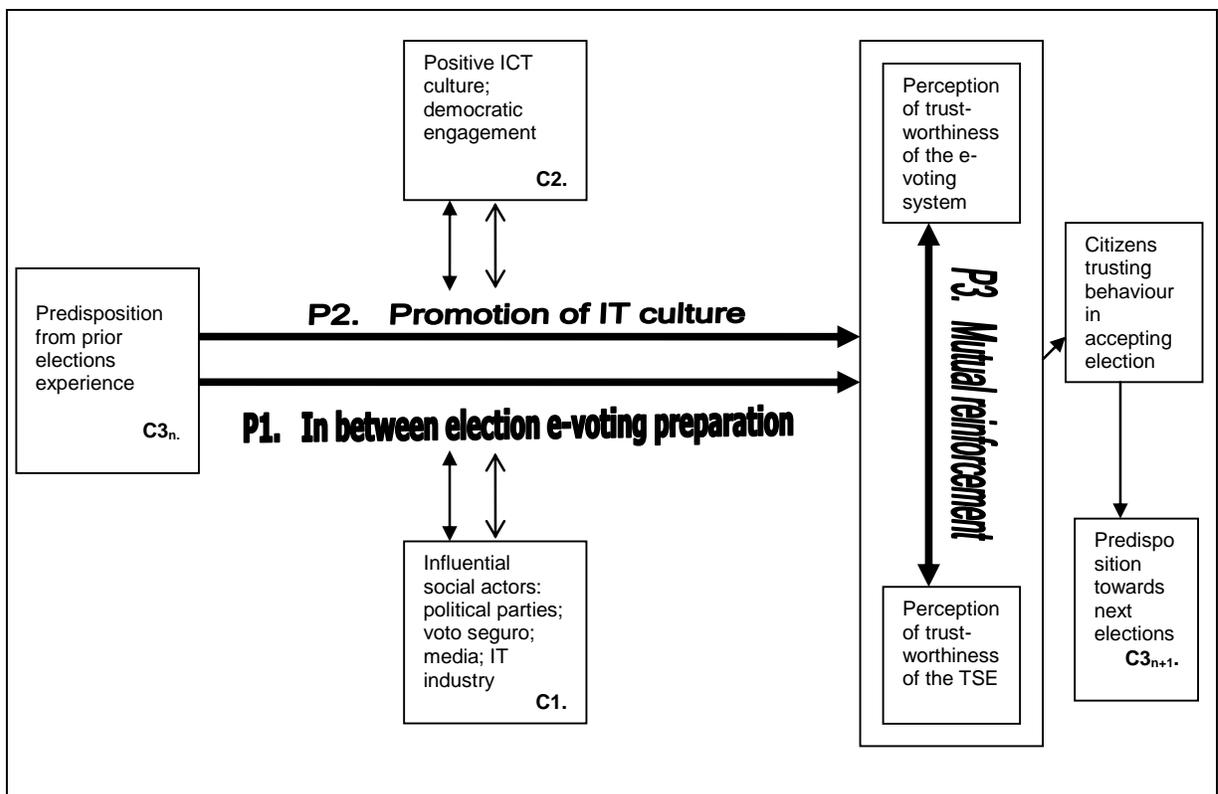


Figure 4. Recurrent Trust-Creation Process

C1 and C2 are structural and dispositional conditions respectively, as in Figure 3. C3n and C3n+1 depict citizens' disposition to perceiving the e-voting as trustworthy that results from previous election experiences (C3n) and contributes to future elections (C3n+1).

P1 refers to the series of activities for upgrading the technology, adjusting the procedures of voting in between elections, and setting up the e-voting system for elections across the country. This process, which is given a great deal of publicity in Brazil, includes approval of amendments to electoral rules, procedures, and technology by parliament, a clear schedule of activities to test the changes by authorised agencies, a public “ceremony” of the sealing of the software, and parallel voting by a paper ballot, involvement of political parties and the media in testing and observing procedures.

P2 refers to the continuing actions of multiple government agencies, NGOs, the IT industry, user industries, education and the media to promote the use of IT as a positive force for development. Particularly important to that effect have been policies to overcome the digital divide and provide Internet access and IT skills to poor communities in rural and urban areas.

P3 refers to the intertwining of the TSE and the e-voting technology. Criticisms of security vulnerabilities of the technology are addressed by the overseeing capacity of the TSE, which subsequently relies on the perception of e-voting as fraud-free to maintain its reputation as a competent guarantor of democracy.

6.3. Analysis Caveats

A cautionary note is required at this point about the limitations of my empirical study and therefore the categories and mechanisms highlighted in this analysis. In this research, I have not been able to adequately investigate differences of trust associated with the social conditions of categories of voters, such as differences of behavior between voters in metropolitan and rural areas and, very importantly, between middle-income people and the poor of metropolitan areas and the north of the country. It is

possible that the lack of contestation of election results has different causal explanations in different social categories. A view suggested by NGO interviewees is that the poor may not challenge the validity of election results because they are indifferent to them and lack faith in parliamentary democracy, rather than because they have trust in the way elections are conducted. Interviewees in a development NGO in Sao Paulo pointed out that poor citizens continue to “sell” their vote, in the sense of voting for the preferred candidate of their employer or in exchange for some other reward. The survey I conducted at Porto Alegre favela after the 2006 elections provides some evidence on the attitude of poor citizens towards elections. Of the respondents to this survey, 30.7 percent had not voted: they gave various reasons in their questionnaire for this, including a lack of information, not having made the effort to register for elections, and feeling unfamiliar with the voting system. Of those who did vote, when asked if they were satisfied with the accuracy of the results, 19.6 percent ticked the “neither satisfied nor dissatisfied” option. These are indications that the behavioral sign to be seen in the lack of challenge to election results may have alternative interpretations that need to be investigated with more detailed research that disentangles more clearly trust in parliamentary democracy and trust in e-voting.

7. Discussion

My study of the Brazilian e-voting in relation to the country’s socio-political context suggests three social mechanisms for the initial citizen trust creation: the association of the introduction of e-voting with the country’s re-democratization, the policy-driven cultivation by multiple agencies in the country of the perception of IT production and use as a positive force for the country’s development, and the association of the perception of trustworthiness of the e-voting innovation with the trustworthiness of the electoral authorities that masterminded and implemented it. It also suggests three similar mechanisms for the continuing trust: the institutionalization of publicly visible actions of continuous caring for the e-voting procedures as part of the country’s enactment of democracy, the continuing promotion of the perception of IT production and use by multiple agencies in the country as a positive force for the country’s development, and the intertwining of the perception of the electoral authorities and e-voting as a trustworthy socio-technical actor conducting elections.

These social mechanisms, the events that triggered them, and the social actors that sustain them are specific to the context of Brazil, in which Brazil’s e-voting has historically been shaped and continues to be enacted. Nevertheless, I propose the following three general mechanisms drawn from the Brazilian experience of formation and maintenance of trust in elections as a kernel for a theory of trust in e-voting.

First, trust in e-voting emerges from and relies on government agents’ and citizens’ democratic engagement. A country’s confidence in its democratic polity affects trust in the introduction and subsequent practice of electoral innovation such as e-voting. A distinction needs to be made between new democracies in which e-voting is introduced as means for strengthening the democratic processes of fair elections and well-established democracies with trusted arrangements for voting. Political scientists have observed differences between citizens’ attitudes towards democracy and its institutions between relatively newly democratized countries—such as Brazil in the 1980s and 1990s and Eastern European countries since the 1990s—and established democracies. Such attitudes affect political engagement, feelings of empowerment, and trust in attempted innovations (Meneguello, 2006).

My study suggests that, in a case of re-democratization, conducting elections with computers came to be trusted as reliable under the control of political agents (e.g., parliament, judiciary, political parties), which were seen by citizens as genuinely engaged with the establishment of democracy. It is reasonable to expect similar attitude of trust in other countries’ mobilization of IT to serve the democratic ideal. But the circumstances of democratization and the form democracy takes differ substantially from country to country, and, in some cases, they give rise to widespread suspicion of the authorities in charge and the political institutions under formation. In such circumstances, and in precarious democracies where elections are routinely rigged (The Economist, 2012), it is reasonable to conjecture that the introduction of e-voting is unlikely to enjoy citizens’ trust. In countries with long-established democratic regimes, where e-voting replaces already trusted institutionalized technologies and organizational actors, the development of trust in new voting arrangements involves

the de-institutionalization of voting processes with taken-for-granted validity and legitimacy and the institutionalization of something novel. The rational myth that sustains trust in existing procedures and technologies (such as their trustworthiness due to the ability of political parties to exercise vigilance effectively and possibility to re-count votes) needs, in effect, to be replaced by another rational myth that necessitates e-voting (such as their trustworthiness due to eliminating fraud-prone delays in producing results or other perceived limitations of the paper ballot) (Meyer & Rowan, 1991). In the process de-institutionalizing the existing and institutionalizing the novel, the risks inherent in the e-voting arrangements are likely to be loudly voiced and affect public trust, while the motives of the institutional actors that support it are likely to be closely scrutinized, as I discuss below.

Second, trust in e-voting is influenced by policies and actions that form citizens' views about IT in contemporary society. Citizens in technophile cultures are likely to be positively predisposed to the deployment of IT in political institutions, and expect that it is the government's duty to bring the benefits of IT innovation to bear on public life. Such positive views cannot be taken for granted and do not faithfully reflect technology's potential. There are good reasons for citizens to be sceptical and suspicious of the way IT is implicated in the economic, social, and political affairs of a country. Concerns about the extent (in terms of affected industrial sectors and length of time) of creative destruction of IT innovation in the economy (Freeman, 1987), and about violations of privacy rights and surveillance by authoritarian or incompetent states, are valid and indeed present in many countries (Lyon, 2007; Raab, 2007). While our understanding of the formation of a positive IT culture is still very limited, the Brazilian case suggests that citizens' attitude towards IT use in government is influenced by sustained government policy across various socio-economic domains and by other public influence institutions, including education and media.

Third, the formation of trust in e-voting is closely associated with trust in the electoral authorities. Perceived motives and competence of the electoral authorities for conducting elections through e-voting affects the perception of trustworthiness of the latter, while active and visible caring of the electoral authorities for a successful and trustworthy e-voting elections infrastructure reinforces perceptions of their own trustworthiness. Institutions with a reputation for being competent and fair arbiters of elections can leverage this reputation by visibly seeking to modernize the election infrastructures and processes. Successful innovation of voting processes through implementing new technology enhances this reputation of competence and caring for the public good. The Brazilian case suggests that, even when citizens are aware that fraud is technically possible with e-voting, they may trust it if they trust the government agent that hosts it. The in-house development of the Brazilian e-voting technology seems to be highly significant in so far as it fostered the perception that the TSE retained control of the deployment and operations of the voting process. There is a risk that e-voting introduces to the voting process actors with motives not necessarily compatible with the main mission of the electoral authorities. A clear example is the distrust of e-voting that developed in the Netherlands, where the conduct of elections was outsourced to an IT services company (Oostveen, 2010). The objective of cost efficiency with which the electoral authorities justified e-voting and the suspected motive of profit making of the new actors challenged their trustworthiness as guarantors of fair elections and, consequently, the perception of trustworthiness of e-voting.

One could speculate that a mutually beneficial interdependence of perception of trustworthiness of electoral authorities and e-voting may be transformed to mutual reputational damage if one of the two constituent actors fails to satisfy their expected role. Suspicion of the electoral authorities for undemocratic or incompetent dealings in tasks other than the conduct of voting, such as allocating national media time to political parties, or trials of allegations of candidates corruption, may extend to suspicion of misuse or mismanagement of e-voting. Incidents of technical malfunctioning of the e-voting system or of breaches of the process of implementing the system that are designed to provide confidence in its integrity may shake citizens' confidence in the overall trustworthiness of the electoral authorities.

8. Conclusion

The contribution of this research is a rudimentary explanatory middle-range theory of trust in e-voting. The proposed theory locates the development and maintenance of perceptions of trustworthiness of e-voting in two national-level processes: (a) the entanglement of the e-voting systems with efforts that serve purposes of democratic elections, and (b) the formation of public attitudes towards IT; and one organizational level process: (c) the intertwining of e-voting with the agency that bears responsibility for the conduct of elections. E-voting is likely to be trusted if it is perceived to be associated with efforts for strengthening fair elections, is introduced and enacted amid other initiatives to create a positive IT culture in the country, and is mobilized by an already trusted government agency. The causal processes that produce trust in e-voting have a spiral rather than a linear form. The fostering of a positive IT culture by government contributes to the development of trust in e-voting, and this subsequently reinforces the public's positive view of IT. A context of democratization or existing trusted institutions of democracy enables trust in e-voting, which subsequently contributes to boost confidence in democratic institutions. The mutually reinforced trust in the electoral authorities and e-voting technology contributes to trust in elections as a broad political institution, which subsequently strengthens citizens' appreciation of the value of the specific socio-technical arrangements for the conduct of elections.

The main value of this contribution lies in the substantive propositions explaining trust in a specific phenomenon, e-voting, that has been unexplored in IS research. Nevertheless, the research presented in this paper and the resulting theory also contributes to the general IS research on trust in the following ways:

- a) It introduces the assemblage perspective of technology in the framing of the object of trust. While this perspective is well established in IS research, it has been absent from research investigating questions of trust. Trust in a hybrid socio-technical institution is relevant for other cases of IT-mediated entities, such as e-business, e-commerce, or e-government. From such framing, noteworthy is the process of mutual reinforcement of trust in the organizational actor mobilizing the electronic services and the technology pointed out by the research in e-voting. This suggests that perceptions of trustworthiness of sellers and user attitudes towards the IT artefacts involved should be treated as intertwined rather than independent variables.
- b) Consequently, the explanatory propositions derived from this framing form a socially-embedded perspective of trust, according to which actors (the citizens in the case of e-voting) develop common perceptions of technology-mediated institutions through their engagement with socio-political issues that matter in their historical setting. This treatment of institutions differs from the way the IS research on trust factored in institutions mainly as guarantors of the trustees' trustworthy behavior. It suggests a view of institutions as significant for shaping meanings, values, and attitudes of individual actors (whether citizens or customers) towards IT-enabled innovation in the public sphere.
- c) The proposed theory adds to the IS literature an example of social mechanisms explanation. This is significant in relation to the current state of an overall bias of IS research towards variance research (Lee, 2010) in general, and IS trust research in particular. It also enhances the process research tradition by identifying causal logic in the unfolding of events, actions and observed outcomes.

Two aspects of the proposed theory require further comments: the extent to which the proposed theoretical model of mechanisms provides a complete explanation of trust in e-voting and the extent to which it is generalizable. Regarding completeness, the three causal mechanisms should be understood as a partial explanation of the formation and maintenance of trust in e-voting. In specific social contexts and at specific instances of e-voting, other conditions and processes may also be implicated in perceptions of trustworthiness and behavior manifesting trust or suspicion. For example,

as I discussed in the analysis of this case study, the apparently trusting behavior toward election results of citizens in poor communities may also be influenced by their low interest in parliamentary democracy for improving their life conditions. Further research is required to trace specific social, economic, and political conditions and processes (such as policies for poverty alleviation) and the way they influence the perception of trustworthiness of e-voting by different social groups.

Generalization of mechanism-based explanation depends on the portability of the causal processes to others cases and contexts (Falletti & Lunch, 2009). It is reasonable to assume that the cultivation of positive IT culture and the mutual reinforcement of trust in the IT actor and the government actor are relevant explanatory mechanisms in e-voting in other countries, too. They are also relevant to trust in other e-government services, such as IT-enabled activities of courts of justice or security services. Further research is needed to unpack these two suggested mechanisms into finer granularity processes and causal relationships. Mechanisms-based analyses are effectively refined by opening black boxes of mechanisms to examine in increasingly more detail their composition of actors, actions and interactions. Further research is needed to investigate the formation of citizens' positive attitude to IT by examining the association of IT with desirable socio-economic effects, as well as by examining public concerns that emerged in the use of IT and the way they have been addressed in different countries.

The relevance of the democratization mechanism needs to be judged according to a country's recent political circumstances. Conditions of democratization mobilization and institution building comparable to those in Brazil have existed in other Latin American countries. Indeed, e-voting systems, albeit with more limited functionality, are used in other Latin American countries too, such as Guatemala and Venezuela, and appear to enjoy citizens' trust. At the time of performing this research, Brazil was advising Mexico on the introduction of DRE technology and other Latin American countries, including Argentina and Uruguay, considered adopting the Brazilian e-voting system. There is therefore ground for testing the validity of the mechanisms models and further refining them in other case study research. A comparison with India, the other large developing country that uses e-voting routinely in its elections, would also enhance this explanatory theory. While each case needs to be understood for its own circumstances of democratic sensitization, which therefore means that the grounds for generalization are limited, the value of identifying this mechanism is in highlighting the embeddedness of the development and use of e-voting in processes of democratic engagement. If this does not happen or if democratic engagement is perceived to be threatened, as in the case of e-voting in the Netherlands, it is likely that trust in e-voting might be shaken.

The three social mechanisms identified in this research provide an analytical basis for guiding action that may create trust in e-voting innovation. The introduction of e-voting should be associated strictly and demonstrably with the cause of democratic elections. Trust in e-voting would be facilitated by actions by state institutions to tap the potential of IT as an enabler of development but also to address entailed economic destruction and culturally valued aspects of private and public life. Above all, it would also require a trusted electoral agency, prepared to transform the conduct of its mission through IT.

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