

# Trust, Identity, and the Effects of Voting Technologies on Voting Behavior

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A model is described to explain the effect of e-voting technology on voting behavior and the outcome of a ballot. In the model, social identity and trust play a central role. After an initial and partial test, the article discusses directions for further research.

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*Keywords:* voting technology; trust; social identity; e-voting

**D**eveloping and introducing new technological applications is a complex undertaking and relates to and depends on many technical, social, political, organizational, legal, and behavioral factors. Therefore, real-life experimentation and multidisciplinary research are required to make the opportunities and risks of new technologies visible, and to improve the reflexivity of design, implementation, and organizational and political choices to be made.

Elsewhere we showed that R&D projects are exploring similar directions, and technological trajectories seem to emerge for most essential technical components (Oostveen & van den Besselaar, 2002). However, social and behavioral issues are generally neglected or studied superficially. If we do not correct this, the result may be an uncritical introduction of new voting technologies, without any fundamental reflection about the technical and, more important, about the social and political modalities of the systems introduced.

This article is based on a large project in which an e-voting system was developed and tested to determine political, organizational, administrative, and legal constraints and possibilities. We studied acceptance, trust, use, usability, organizational aspects, and the implications for voting behavior and the turnout (Oostveen & van den Besselaar 2004a, 2004b; van den Besselaar, Oostveen, De Cindio, & Ferrazzi, 2003). Our aim is to contribute to fundamental and applied knowledge about the effects of different media on voting behavior and opinion articulation and to improve social choice in designing and implementing electronic

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voting technologies. At the same time, we aim at contributing to the scholarly debate about e-voting technologies in use. Without data from large-scale Internet voting experiments it is difficult to clarify the influence this new voting method may have on the turnout of voters and on the way different contexts could affect voting.

## **THEORETICAL BACKGROUND: TRUST AND SOCIAL IDENTITY**

In this article, we address the question to what extent the voting technology influences the articulation of (political) preferences and opinions by citizens, and how this effect is mediated by sociological and social psychological variables, in particular trust and social identity.

Trust is important for voting systems. Apart from economic requirements, most requirements for e-voting systems are trust related. They should be secure (accurate; only legitimate voters participate, and only once; protected against fraud and mistakes), protect privacy (the voter should remain anonymous), and be verifiable (a transparent process, possibility of recounting). Traditional paper-based voting in polling stations satisfies these requirements, follows a transparent procedure, and is trusted by citizens—at least in democratic countries. In contrast, e-voting systems are not transparent for the user, as the steps in the processing of the information cannot be observed. With electronic voting systems, public confidence in the election relies on trust in the organizers of the ballot, and in the technology (and technical experts) instead of on a transparent procedure (Internet Policy Institute [IPI], 2001). Public confidence in the manner in which ballots are counted is fundamental to the legitimacy of the electoral process. In addition, the same holds for trust in the secrecy of the voting. The level of trust may influence the decision to use e-voting systems, and even the vote itself. Trust, therefore, is a crucial factor for e-voting to be successful.

Empirical evidence relating to the precise impact of the Internet and other information and communication technologies (ICTs) on trust is still sparse and sometimes contradictory (Guerra, Zizzo, Dutton, & Peltu, 2003). Elsewhere we discussed how trust in e-voting systems is related to the sociotechnical characteristics of the system (Oostveen & van den Besselaar, 2004b). Here we focus on the question whether the level of trust influences the participation in and the outcome of an electronic ballot. How would trust in the security and privacy influence the voting? We do not consider the technology as such having direct effects on voting turnout, and on the outcome of the vote. However, voters may have different levels of trust in different voting technologies, and this may influence the participation in and results of the voting. If a system is not trusted to be secure (that means if a voter expects that the system is easy to attack by hackers from outside the polling organization, or that it is easy to falsify the outcome), the voter may be inclined to use—if available—another medium he or she expects to be more secure. The voter may also decide to abstain from participating altogether, resulting in a lower turnout. This may be different in case the voter does not trust that the system protects his or her privacy. In this case, the voter fears that others may be able to observe his or her vote (surveillance), and therefore abstain from voting, or vote more politically correct, and adjust to majority opinions. The more sensitive the topic of the vote is, the stronger this effect is expected to be. We expect that lower trust in the privacy of the technology results in less radical voting and in a lower turnout.

Another important difference between e-voting compared to standard voting is that it can be done in the privacy and security of one's own home rather than at the polling station. The social-psychological implications of this have been paid little attention hitherto. One important implication of e-voting is that when one votes at home, isolated behind the computer terminal, a more individual level of identity (and more individual self-interests) is likely to

become salient compared to when one votes in the community hall, surrounded by other people from different groups and backgrounds, or at work surrounded by colleagues. In the latter two cases, collectivist and even multicultural concerns may be more salient.

This expectation is based on the social identity theory. Social identity refers to “that part of an individual’s self-concept which derives from his knowledge of his membership in a social group (or groups) together with the value and emotional significance attached to that membership” (Tajfel, 1978, p. 63). Research shows that people’s social identities have a very powerful impact on their perceptions, emotions, and behavior (Ellemers, Spears, & Doosje, 2002). “People act in ways specific to their situation” (Brader, 2001), and “The basic assumption here is that the relevant social context determines which categorization of social stimuli, and hence which identity aspects become salient as guidelines for the perceptions and behavior of those who operate within that context” (Ellemers et al., 2002, p. 165). The central departure in the social identity approach is that the impact of social groups on the way people see themselves and others around them cannot be understood without taking into consideration the broader social context in which they function (Ellemers et al., 2002).

Different voting contexts influence not only which identities and interests are made salient but also behavior relating to these identities and interests for strategic reasons. For example, being confronted with different groups of people at the polling station (or on the way to it) may make one feel more accountable to these audiences (e.g., ethnic minorities, the poor) than when at home on one’s own, or surrounded by one’s family. When group members define themselves in terms of their collective identity they focus on the similarities between themselves and fellow in-group members with reference to experiences, needs, interests, or goals. As a result “my” and “your” experiences, needs, and so on are transformed into “our” experiences and needs (Stürmer & Kampmeier, 2000, p. 107). This is particularly likely to affect voting behavior when this is identifiable (and thus accountable) to an audience that might disapprove. For example, many polls underestimate self-interested or right-wing preferences because they fail to take into account that people might not want to admit to such preferences in public. Contexts in which people perceive there is scrutiny of their choice may, therefore, affect voting for strategic or self-presentational reasons. Examples of a high accountability context are votes that are conducted in public (e.g., in mass meetings with a show of hands), rather than by private ballot. Although e-voting may seem private, one of the concerns associated with this technology is whether it is indeed secure, or open to surveillance by those administering the system. The perception of surveillance may moderate voting preferences perceived to be critical of such authorities.

Another factor that may well cause features of e-voting to influence voting preference is the degree of social interaction and discussion around political topics prior to voting. Voting from the home increases the likelihood that choices will be discussed within a limited and homogeneous group context, whereas voting in the community may open the voter up to disparate social influence from others, especially those relating to more prosocial or collectivist concerns. This process of validating views through discussion has been called group consensualization (Haslam, 1997). Because discussion is likely to polarize in line with group norms and identities (Spears, Lea, & Lee, 1990) the parties to discussion can be highly influential. Of course, we are not claiming that political preferences will be entirely determined by the voting context. However, these contextual effects may be especially important in the case of so-called floating voters, who often decide elections.

Internet-based voting enables individuals to vote from many places and at different moments and, therefore, in different social contexts. If the context influences someone’s identity, then one would expect to find different voting outcomes for the different voting locations. We study an effect of voting technology mediated by the social dimensions of the

possibilities and use of the technology. What would one expect? When voting from home, the voter is protected from peer pressure, and is inclined to perceive the world from a more private identity, and vote accordingly. On the other hand, in a voting booth, at work, or at school, the voter may tend to perceive the world from a more social or collective perspective, which may also influence the vote.

## METHOD AND MODEL

To study e-voting and e-polling in practice, a series of tests was organized that enabled us to study which factors influence the way voters use (or do not use) e-voting systems, with the emphasis on naturalistic conditions and a variety of geographical and sociocultural contexts. Because of legal constraints, the system could not be tested in real elections. Nevertheless, 14 polling events were organized by local authorities (a town in France, a London neighborhood in the United Kingdom, a trade union board in Italy, and two community networks in Italy and Finland) about real issues such as urban traffic, car parking, a neighborhood watch scheme, welfare services, and citizenship rights of immigrants (van den Besselaar et al., 2003).

We compared three voting technologies: paper, CAWI (computer-aided web interviews), and TruE-Vote. A first main difference between CAWI and TruE-Vote is that to use the CAWI system only minor registration is needed for participating (real name and address). On the other hand, PKI-based voting systems such as TruE-Vote require an extensive registration in which one has to give much personal information to the institution that issues the smart card. Consequently, exercising the vote involves a much stronger identification. A second main difference is that TruE-Vote requires special hardware and software for the voting, and this was provided by the organizer of the vote. Both differences may result in different levels of trust in the privacy and security of the system. Using TruE-Vote for home voting requires installing the system, and consequently some skills, an Internet connection, and a personal computer that is not too old. Here (but also related to trust), the digital divide may have effects.

Data collection was done by a variety of methods: prevoting and postvoting questionnaires, observation, log file analysis, analysis of the ballot outcomes, and interviews with ballot organizers and voters. Through this we measured the relevant variables that influence the use of e-voting technologies on the individual and organizational level. The questionnaires were designed to measure some theoretical constructs we expected to influence voting turnout and voting behavior. Therefore, we created blocks of items to measure trust in privacy of the system, trust in security of the system, social identity, and so on. As a first step, we used factor analysis to check whether the items indeed measure what they were expected to measure, and this proved to be the case. The analysis resulted in factors representing the theoretical constructs. In the next step, we used the items loading on the same factor to make a scale for the theoretical construct represented by the factor. A simple procedure was adopted for this: We take the average of the scores on the items. To test the internal consistency of the so obtained scales, we calculated Cronbach's alpha for every scale, and this resulted generally in reasonable values above .8. As we had a relatively small population size, we decided to dichotomize several variables. In those cases where the variable has a normal distribution or a flat distribution, we combined the three positive values (agree a little, agree, agree completely), and we did the same for the three negative values. In case of a bimodal distribution, we divided the scores accordingly. Table 1 summarizes the variables used.

Elsewhere we analyzed privacy and surveillance concerns, trust issues, learning effects, usability, and organizational aspects. Here we analyze media effects of the voting technol-

**TABLE 1**  
**Variables**

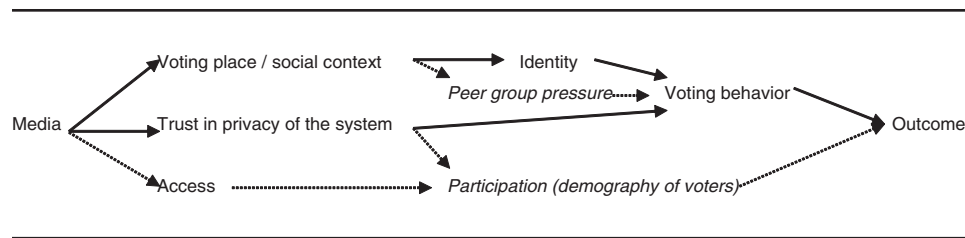
Independent variables:	
1. Characteristics of the voter:	Age, gender, income, nationality, education, attitude, experience with new technologies
2. Voting technology and/or medium	Paper; CAWI, True-Vote
3. Voting place	Kiosk, home, school, work
4. Characteristics technology	Personal information needed for the smart card; availability of tools for audit and verification.
5. Organization of the ballot	Who “owns” and organizes the ballot
6. Experience with e-voting	Three subsequent ballots
7. Topic of the ballot	Level of sensitivity of the topic
Intermediate variables	
8. Trust in system	Opinion about privacy, surveillance, behavior (participation)
9. Social identity	Collective versus individual and/or social versus individual
Dependent (effect) variables	
10. Participation in the ballot	Differences in participation between the various media — turnout and demography
11. Result of the ballot	Different outcomes for the various media
12. Opinion about e-voting	Acceptance, unavoidable, good or bad
13. Usability	Is it easy, quick, transparent, in the various dimensions: use in general, access, vote, correct mistakes, send the vote, verify the vote, and so on

NOTE: CAWI = computer-aided web interviews.

ogy on voting behavior and on the outcome of the vote. Based on the theoretical discussion in section two, we formulated the following model: Technology enables a variety in the place of voting. Place is related to social identity, and to the presence of others, and both may influence the decision to vote and the vote itself. In addition, trust in the technology and fear for surveillance may influence the decision to vote and the vote itself. Finally, the digital divide may influence the participation in an election and, therefore, the outcome. The model is presented in the Figure 1. In the remainder of the article we do not use the complete model and exclude, for the moment, the “dashed” relations and “italic” variables access, peer group pressure and participation.

### *A Small-Scale Field Experiment*

We did a preliminary test of a part of the model in a small-scale experiment organized by OYK (Learning Upper North Karelia), a community network serving a remote rural area in rural Finland. OYK has, on a regular basis, opinion polling, and our field experiment was one of these. A total of 179 people between the ages 15 and 72 years registered as voters for the experiment. The question asked was “Should Finland become member of the NATO?” It was a topical question, as it was asked at the beginning of the Gulf War, and in general the majority of the Finnish population is against NATO membership (Centre for Finnish Business and Policy Studies, 2002). To investigate the effect of media on voting behavior, we divided the participants into four groups based on two voting media (CAWI vs. TrueE-Vote voting) and two voting places (home voting vs. voting in public spaces—work, school, voting booth).



**Figure 1: The Model**

*Trust.* Our hypothesis is that the higher the trust in the privacy of a voting system is, the larger the probability will be that someone expresses her minority opinion, which means in this specific case voting for NATO membership. Our research shows that the two voting technologies are trusted differently, with the TruE-Vote system scoring higher on trust than the CAWI system. As predicted, the CAWI users more often have the majority opinion voting against joining the NATO, while there is a higher level of pro-NATO votes in the TruE-Vote system. Now one might argue that this finding is an effect of self-selection of the respondents. This does not seem to be the case. When we control for the variable “trust”, the difference in voting behavior between the TruE-Vote users and the CAWI users disappears. In other words, trust in the voting technologies does influence the voting behavior.

*Social identity.* One would expect that when voting from home, the voter may tend to perceive the world from a more private identity, whereas people being in a voting booth, at work, or at school may tend to perceive the world from a more social or collective perspective. This implies first that home voters are expected to resist the majority perspective more strongly, as they find themselves protected from peer pressure, and therefore we expect that within the group of home voters the share of pro-NATO opinions is higher than average. Second, being at home may stimulate a private family identity, focusing on safety and protection, and this may influence people to vote for joining NATO, while a more collectivist identity may focus to a greater extent on the political aspects of joining the NATO. This leads to the second hypothesis: Voters from home will more often be in favor of Finland joining NATO. This was confirmed by the data. Of course, one may argue that voters’ identity determines simultaneously the choice of the voting place and the vote itself—again a problem of self-selection. This can be tested because the respondents completed a questionnaire several months before the experiments took place, and two during two subsequent experiments (also with an interval of several months). We, therefore, have for all the respondents three scores for social identity. Comparing these, we find a high correlation between the social identity scores measured during the two voting sessions (controlling for the voting place) but a much lower (about one half) correlation with the prevoting scores for social identity. Therefore, it is unlikely that the effects we measured were based on self-selection. We also controlled for other variables, such as gender. As one may expect that identity is gender based, we analyzed the same relations for men and women separately, and we found similar distributions in both subgroups for the identity-based variables. The relation between voting place and vote also remains when controlling for gender.

**Table 2**  
**Summary of Findings**

<i>Expected Relation</i>	<i>Expected Effect</i>	<i>Finding</i>
1. Trust in technology → voting behavior	Less trusted technology → Less radical voters	Yes—small effect
1a. Controlling for trust in privacy	Effect 1 disappears	Yes
2. Place of voting → social identity	Home voters have more “private identity”	Yes—strong effect
2a. Controlling for gender	Effect 2 remains	Yes
2b. Identity is not fixed	- Not a high correlation between “nonvote scores” and “vote scores” on identity over time - High correlation between “vote scores” on identity over time (constant voting place)	Yes
3. Place → outcome vote	Home voters vote more private	Yes—small effect
3a. Control for gender	Effect 3 remains	Yes

## DISCUSSION

In this explorative study, we presented a model for studying the effects of voting technologies on the turnout and outcome of ballots, as part of a larger study of the social aspects of e-voting technologies. We also conducted a preliminary test of two hypotheses about how trust and social identity mediate the effects of voting technologies—through their social dimensions—on voting behavior. The aim is to test whether we can find the social-psychological effects of voting technology through trust and identity on voting behavior.

We used a small and self-selected sample. The findings, therefore, should be taken for what they are: preliminary. On the other hand, the study is a field experiment and aims to find first indications of whether specific social-psychological effects may occur in the use of e-voting technologies. So we do not aim at generalizing to a larger population. To do this would require not only a larger sample but also a representative one—and our respondents were self-selected. Does this invalidate the effects we have found? To check this, we did some tests, such as controlling the stability over time of the identity scores of the respondents, and we found low correlations. This suggests that the choice of the voting place was not based on the opinions of the voter that also determine the vote. The effect of self-selection may be not that serious.

As all hypotheses are supported by the data, we think that it is worthwhile to continue research in the direction outlined in this article. A few things seem obvious to do. First, more large-scale field experiments are needed to study the effects of voting media on voting behavior, as this would enable a serious multivariate analysis. Second, psychological laboratory experiments may inform us more precisely about the psychological mechanisms underlying the effects we think we have identified in this article. Finally, even if the media effects on voting behavior and participation do exist, it needs to be investigated what the aggregate effect on the outcomes of ballots would be. The effects we found were small; however, this does not make them less important. Small effects may become decisive in situations where parties, persons, or opinions have about the same support. Small effects are also important in cases with large majorities, as the indicated effects may make small minorities even less visible.

To our knowledge, this is one of the first studies in which data from real deployment of e-voting technologies could be gathered and analyzed. We suggested how voting technology may influence voting behavior, and through this the outcomes of ballots. At the same time, the approach shows how technologies have social effects, without taking a technological determinist point of view. Finally, the article also shows how real-life experimentation can be used to assess the possibilities and risks of new technologies, even in an early stage of technology development.

## REFERENCES

- Brader, A. (2001, February). *Young people's use of ICTs: A practitioner's perspective*. Paper presented at the Ethics, ICT and Social Exclusion Conference, Bolton, UK. Available at [www.mmm1.fsnet.co.uk/downloads/ypict.pdf](http://www.mmm1.fsnet.co.uk/downloads/ypict.pdf)
- Centre for Finnish Business and Policy Studies (EVA). (2002). *Finnish EU attitudes 2001* (SPSS-datafile). Tampere, Finland: Finnish Social Science Data Archive.
- Ellemers, N., Spears, R., & Doosje, B. (2002) Self and social identity. *Annual Review of Psychology*, 53, 161-186.
- Guerra, G. A., Zizzo, D., Dutton, W., & Peltu, M. (2003, April) *Economics of trust in the information economy: Issues of identity, privacy and security*. Paper prepared for the Organization for Economic Cooperation and Development (OECD), Oxford, UK: Oxford University Press.
- Haslam, S. A. (1997). Stereotyping and social influence: Foundations of stereotype consensus. In R. Spears, P. J. Oakes, N. Ellemers, & S. A. Haslam (Eds.), *The social psychology of stereotyping and group life* (pp. 119-143). Oxford, UK: Blackwell.
- Internet Policy Institute. (2001, March). *Report of the National Workshop on Internet Voting: Issues and Research Agenda*. Study sponsored by the National Science Foundation, conducted in cooperation with the University of Maryland, USA.
- Oostveen, A., & van den Besselaar, P. (2002). *Internet based voting*. Amsterdam: True-Vote Deliverable 2.1.
- Oostveen, A., & van den Besselaar, P. (2004a). Internet voting systems and civic participation. *Javnost—The Public*, 13(1), pp. 61-78.
- Oostveen, A., & van den Besselaar, P. (2004b). Security as belief: User perceptions of the security of electronic voting systems. *Lecture Notes in Informatics*, P-47, pp. 88-97.
- Spears, R., Lea, M., & Lee, S. (1990). De-individualisation and group polarization in computer-mediated communication. *British Journal of Social Psychology*, 29, 121-134.
- Stürmer, S., & Kampmeier, C. (2000). Active citizenship: The role of community identification in community volunteerism and local participation. *Psychologica Belgica: Special Issue Social Identity and Citizenship*, 40, 103-122.
- Tajfel, H. (Ed.). (1978). *Differentiation between social groups: Studies in the social psychology of intergroup relations*. London: Academic Press.
- van den Besselaar, P., Oostveen, A., De Cindio, F., & Ferrazzi, D. (2003). Experiments with e-voting: Experiences and lessons. In P. Cunningham (Ed.), *Building the knowledge economy: Issues, applications and case studies* (pp. 719-726). Amsterdam: IOS-Press.

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