How to successfully implement internet voting?

Strategic recommendations on overcoming remote e-voting challenges

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Abstract

The paper introduces an up-to-date, holistic model of contemporary challenges associated with remote e-voting (internet voting) and uses it to discuss workable and clear-cut solutions for each of the multiple internet voting constraints. It offers a complete guide along an array of specific tactical measures to be taken to cope with or prevent the majority of known problems with remote e-voting. Most importantly, the paper presents a set of important strategic recommendations which embrace the best practices and expert knowledge in the field and can pave the road to success in implementing remote electronic voting in legally binding political elections.

Keywords

Internet Voting
Electronic Voting
Electronic Democracy
Electronic Participation
ICT-Implementation

Outline

1. Introduction

In the digital age democratic systems increasingly resort to technology to support, compliment, or even transform political processes. The growing use of various electronic means in elections reflects the general tendency of increased digitalization, greater outreach, and enhanced mobility in our societies. The administration of elections around the world undergoes important transformations with the modernization of various procedures in the electoral cycle and experimenting with technologic means to achieve a better quality and performance (efficiency, transparency, accuracy etc.).

Computerized tools used at different stages of the electoral process include electronic voter registration, automated counting of votes, internal election data management software, electronic voting machines at polling station etc. (Caarls, 2010). One of the most advanced use cases of election technology nowadays is remote electronic voting, i.e. the use of electronic means in the casting of the vote done in an uncontrolled environment (via internet, mobile phone, kiosk) (Council of Europe, 2004).

Although the use of remote e-voting has been on the rise recently with three legally binding electronic elections held in Europe in 2011 (Estonia, Norway, and Switzerland), the overall use of i-voting in political elections is still an exception rather than the rule. This can be attributed to the extraordinary complexity of introducing technology into the voting process in political elections and a great number of difficulties occurring, or feared to occur, in such a multi-dimensional context.

Nonetheless, in the age of technology further digitalization of the social and political life is unavoidable, which means (remote) electronic voting practice has a good incentive for improvement and rapid development. That is why it is important to find and apply workable solutions to the existing problems and constraints which restrain progress in this field and help the new voting technology fulfil its potential in the near future.

1.1. Background

This working paper is grounded on an earlier study conducted by a member of the E-Voting.CC team[1]. The research in question aimed to establish all possible factors which hinder the use and implementation of remote e-voting in Europe. It used the Delphi method, a series of questionnaires addressed to an identified panel of experts in the e-voting field, to achieve this objective. The output of the Delphi survey was a comprehensive list of challenges to remote electronic voting which was consolidated from experts' responses and validated by them as well.

The intention of the current study is to work from the obtained list of challenges and develop a set of guidelines on how to resolve them in an efficient way.

2. Methodology

To provide an appropriate solution for each of the identified challenges a number of e-voting community members have been consulted: legal experts, technical specialists, project managers, researchers, government officials etc. The respondents to the survey were selected using a purposive sampling technique, i.e. were chosen based on the criteria of having first-hand knowledge and proven experience in one of the areas the identified challenges described. Thus for each of the 15 challenges the research team had one to three designated informants who provided their opinions regarding the possible solutions to the challenges. The data was collected using e-mail questionnaires and phone interviews and processed qualitatively.

Besides, a call for responses to selected questions was posted on the International IDEA's ACE Practitioners Network webpage which enabled us to reach out to a

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[1]Susha, I. (2011). *A Delphi study of contemporary challenges to electronic voting.* (Master thesis, Örebro University, 2011). Abstract available at <http://urn.kb.se/resolve?urn=urn:nbn:se:oru:diva-16397>.

numerous international audience of election professionals and verify the provided knowledge and comments.

2.1. Classification model

In the present study the following classification model of implementation challenges for remote electronic voting was applied:
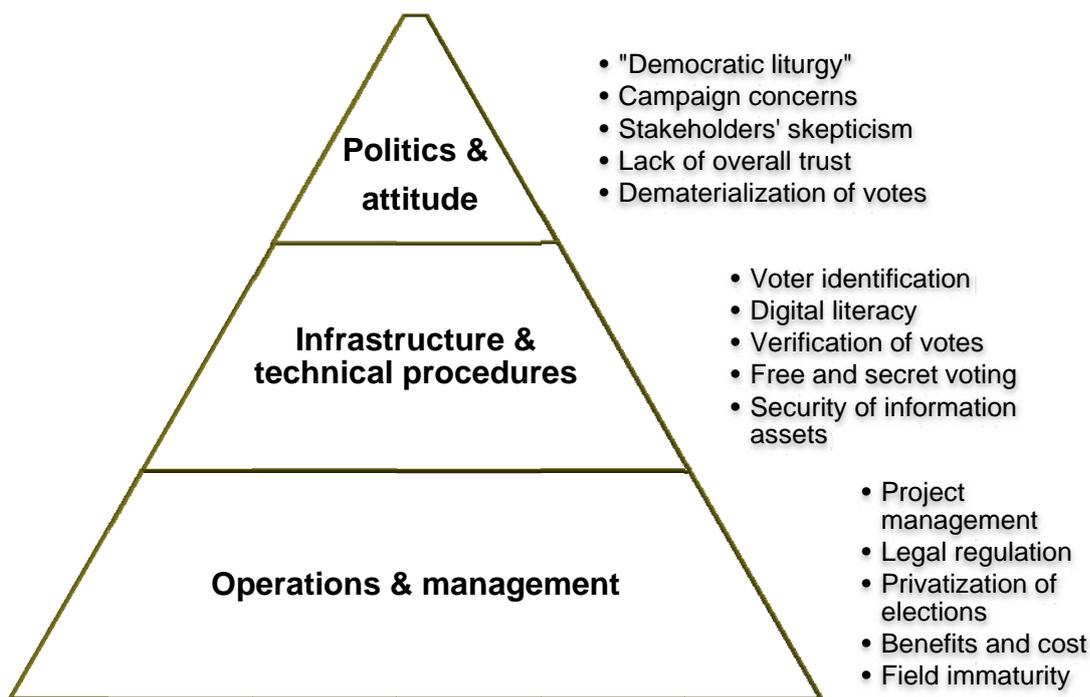

Figure 1: Classification model of challenges to the use and implementation of remote e-voting in legally binding elections

The model illustrated above conveys the idea that the whole multitude and variety of challenges to the more efficient use of e-voting technologies in legally binding political contexts can be divided into three major clusters (layers). The "tip of the iceberg" (upper level in Figure 1) is the attitude of stakeholders towards remote e-voting technologies and concerns about the transformation effects it can have on democratic processes. The middle layer in Figure 1 combines the problems which occur with the "hard" aspects of the remote e-voting phenomenon, i.e. the technical infrastructure, software solutions, computer security and digital skills. Finally, the base layer is the cluster of challenges encompassing practical constraints in the management of e-voting projects amongst others the relationship with vendors, project economy, and organizational nuances.

These three groups of challenges are organized in a pyramid model because they are intertwined and related to each other. The attitudinal problems are grounded on the perception of the reliability and trustworthiness of the voting technologies as well as the management capabilities and efficiency with which the election authorities and technical personnel handle and operate it.

In conclusion, the implementation of electronic voting technologies has to embrace all the environmental factors surrounding the project which are the regulatory and managerial aspects (lower layer in Figure 1), the existing socio-political frame (upper layer), and the current state of technologic development (middle layer).

3. Results and discussion

Following the analysis of challenges and solutions all levels are discussed and presented according to the above-mentioned pyramid model (operations and management, infrastructure and technical procedures as well as politics and attitude). Each challenge is matched with a solution to provide a comprehensive structure and to enable a fast and easy application in real world situations.

3.1. Operations and management

In Table 1 below the constraints which electronic voting projects encounter at the level of Operations and management are paired with the respective solutions.

Table 1: Level 1 – Operations and management: constraints and solutions

CONSTRAINTS	SOLUTIONS
Project management ▪ The task of managing an e-voting project is very complex as the implementation process is prone to many mistakes (due to integration of several systems into a multi-aspect socio-technical process)	▪ Allocation of more resources for the planning stage in the project management process ▪ Specific resources for testing technology under realistic settings ▪ Timely installment of necessary system pre-requisites to ensure smooth integration of the different components. ▪ Interdisciplinary and capable staff to handle the project in a professional manner
Legal regulation ▪ Absence of the necessary legal framework can seriously affect an e-voting project as the making of amendments is a lengthy process	▪ Sufficient time for discussion in the legislature and public debate ▪ Integration of e-voting into the larger context of electronic governmental services in terms of strategy
Privatization of elections ▪ When electronic voting process is managed by a contracted private company and not EMB officials it can undermine confidence in elections	▪ Enabling competence building within EMBs focusing on the technical aspects of e-voting systems ▪ Establishing clear relations with vendors ▪ Information sharing and access
Benefits and cost ▪ The costs of implementing an e-voting system in political elections are high while the prospective short-term returns are uncertain which can make the inputs disproportional to the outcomes	▪ Cost analysis of an e-voting system has to include the lifetime of technology in comparison to similar voting methods ▪ Benefits for certain voter groups have to be put in perspective ▪ The interrelation between electronic voting technologies and increased turnout is not guaranteed ▪ Required communication campaigns on new voting technologies contribute to higher usage of e-voting option
Field immaturity ▪ Due to the recency of the e-voting domain and few large-scale implementations, there is little knowledge on best practices in the field and low exchange of project data in the professional community	▪ Common, publicly available gateway to the detailed information on e-voting project cases is lacking ▪ Efficient accumulation of practical knowledge and support of more applied research on the subject are required (db.e-voting.cc)

All above mentioned specific solutions to the challenges at this level can be summarized into three strategic recommendations:

1. **Holistic and integrated project planning;**
2. **Enhancement of knowledge capital;**
3. **Investment in human resources.**

First, it cannot be overlooked that the present vision of (remote) electronic voting technologies as a business case needs an update with regards to perceived returns of technology projects and good management practices. The rationale for introducing technology into the voting process needs deeper reflection: so far one of the most appealing benefits of e-voting technology has been its potential to increase voter participation, but the available evidence of this fact is scarce and uncertain. Therefore, a profound and stringent cost-benefit analysis prior to the introduction of e-voting is strongly recommended as a measure to create realistic expectations of the system among all involved stakeholders. It is worth highlighting that voting technologies should not be perceived as an instant remedy for socio-political problems like degrading engagement of citizenry with democratic institutions and the low level of confidence in political administrations. In defining expectations it is a more realistic approach to focus on increased efficiency and accuracy in processing ballots and on modernizing the electoral process in the first place. In doing so e-voting project planning should be better reinforced with comprehensive feasibility studies, extensive system testing, and complete modernization assessment and in general assume a holistic and integrated approach.

Second, since the field of electronic voting is an immature research domain and a rather experimental practical arena, there is a strong need to support knowledge accumulation and exchange in the professional community. To date there have been a considerable number of experiments with remote e-voting around the world (see e.g. World map of electronic voting; E-Voting.CC, 2009), but still there is no shared understanding among electoral officials of the best practices in this regard. The database of electronic voting by E-Voting.CC is currently one of the few examples aiming at bridging this gap and providing cross-country knowledge on the use of electronic voting technologies (http://www.db.e-voting.cc). That is why cross-

boundary information sharing and increased inter-organizational collaboration between stakeholders (vendor companies, election authorities, academic researchers, civil society groups) with regards to different national experiences with electronic voting technology should be even more strongly encouraged. Given the fact that at present there is a wide divide and observed controversy between different players in the e-voting field (practitioners vs. researchers, EMBs vs. vendors, NGOs vs. EMBs etc.), a crucial pre-requisite for more efficient knowledge exchange is building genuine trust among the partners involved in the process. Apart from that, neighbouring countries frequently share similar challenges in modernizing their democratic systems and participatory processes which makes cross-country learning and knowledge exchange even more important (Salem, 2007).

Third, the use of electronic means at the vote-casting stage is a complex socio-technical process in which a politically meaningful outcome is reliant on the smooth functioning of hi-tech equipment which makes the stakes rather high. Naturally at this point the majority of personnel responsible for different aspects of the electoral process belong to the "non-experts" group with regards to the functioning of IT components of the e-voting system. Competence building at individual and organizational levels is a most necessary measure to take, if electronic voting is to be taken seriously. Election officials need to be capable of regaining full control of the voting process, and intensive professional education is a straightforward means to do so. Besides EMBs, even greater amount of attention in terms of the enhancement of skills and knowledge requires the project management personnel since the set of competences required from them is extremely demanding.

3.2. Infrastructure and technical procedures

The problems which occur at the level of Infrastructure and technical procedures in remote e-voting projects are presented in Table 2 below together with the respective solutions which can be potentially helpful in these situations.

Table 2: Level 2 – Infrastructure and technical procedures: constraints and solutions

CONSTRAINTS	SOLUTIONS
Voter identification ▪ Availability and usability of electronic ID cards are serious problems: creating a system for digital identity provision is a costly and time-consuming process and it also has to reach high levels of popular usage to be effective.	▪ Introduction of integrated multi-functional eID systems ▪ Use of eID for other electronic services to make the solution more cost-efficient and enable the citizens learn faster how to use them ▪ Using other forms of electronic identification and registration e.g. via mobile phones
Digital literacy ▪ Due to digital divide (uneven distribution of digital devices and skills in using them) introduction of (remote) electronic voting risks to create unequal opportunities for voters to cast their vote.	▪ Enhance computer literacy in the population by encouraging the citizens' exposure to other electronic services apart from e-voting in the course of daily lives ▪ Roll-out of comprehensive voter education programs at an early stage in the e-voting implementation
Verification of votes ▪ The process of end-to-end verification of votes lacks popular understanding and acceptance among the non-experts; the procedure is not yet enough tested in real-life settings.	▪ Engage non-experts in education about the technical basics of computer systems ▪ Targeted presentations to facilitate the understanding of E2E procedure ▪ Sufficient amount of field trials to raise the credibility of the verification methods in use
Free and secret voting ▪ In remote e-voting (due to uncontrolled environment) the voters themselves are responsible for ensuring the casting of the vote in a free and secret manner.	▪ More flexibility for voters in casting the vote (like choice of location for vote casting, access to public kiosks, reversible vote option) ▪ Publish and inform on ethics and conduct of voting
Security of information assets ▪ There is a risk that some malicious software or activity can compromise the integrity of the e-voting system changing the votes or blocking access to the service.	▪ Not specific to electronic voting but shared by many electronic (public) services available on the internet ▪ Harden the technological infrastructure (e.g. multiple voting channels, trusted voting terminals, independent verification systems) ▪ Ensure a continuous and comprehensive voter information and voter education ▪ Provide self-detection tools for the voters to ensure the security of the computers

The following are the strategic deductions from the specification of problems and solutions at the Infrastructure and technical procedures level as outlined above:

1. **Integration with other e-services;**
2. **Adaptability and flexibility in design;**
3. **Fair risk assessment and comprehensive voter information.**

First, better connectedness of remote electronic voting plans and projects to other internet applications in the public and private sectors is able to solve a number of technology related problems at one time. Integration of remote e-voting with other electronic services (e.g. through the use of multi-functional eID cards) is not only a more cost-efficient infrastructure solution but can facilitate the graduate acceptance of this voting method via continuous learning of internet operation routines by the users. Besides potential uptake of the e-voting option and electronic turnout, another benefit is the experience all other government internet services share in terms of security and data protection which remote electronic voting can certainly gain from. The inclusion of electronic voting into a long-term national ICT strategy and country's e-government agenda is able to ensure the adoption of an "agile" development approach to the digitalization of democratic processes (similar to following a roadmap as was demonstrated in Krimmer & Kripp, 2008).

Second, as the analysis clearly indicates, remote e-voting is there to adapt to the society and not vice versa; therefore it should be a timely response to a more mobile and tech-savvy lifestyle of people and not an aim in itself. It is a shared opinion that with the change of generations and respective mind shift internet will become a normal medium for voting in political elections as well. But until then it is worth giving some thought to the degree of readiness of the society in a geographic area of interest for voting via remote electronic channels using e.g. the E-Voting Readiness Index (2008). Furthermore, here it is also relevant to emphasize the usefulness of user-centric design in developing the e-voting process and tailoring certain specifications to the needs and attitudes of the user group.

Third, the importance of narrowing down the knowledge gap regarding e-voting technicalities which the majority of stakeholders presently share cannot be

overstressed. It is of absolute necessity for these stakeholders to gain understanding of the technical basics of the e-voting process. But at the same time efforts should be made to present this knowledge as better accessible, more comprehensive, and more appealing to the general audience. Apart from the stakeholders' expertise issue, making trade-offs is an optimal approach to the security of electronic voting: since it is impossible to provide 100% protection from all kinds of attacks for the whole time, one has to accept certain risks and do everything possible to lessen the negative effects. Thus sufficient knowledge and time investment as well as a thorough risk assessment have to be executed to ensure the integrity and security. A similar logic applies to voter misbehaviour, for instance vote buying and the risk of voter coercion. The control over the vote casting act in this case is not direct which is common to any distance or remote voting channel like postal/mail voting but similar with many other risks. A fair risk assessment and comprehensive voter information and measurements like multiple voting channels can decrease risks and increase the integrity of the process.

3.3. Politics and attitude

Table 3 below provides an overview of the difficulties which remote e-voting faces at the level of Politics and attitude together with the solutions.

Table 3: Level 3 – Politics and attitude: constraints and solutions

CONSTRAINTS	SOLUTIONS
"Democratic liturgy" ▪ Casting the vote in a private setting (from home, work etc.) is feared to diminish the symbolic value the voting process traditionally bears, i.e. that of a civic ritual, collective action, and political socialization.	• Facilitate the debate on remote electronic voting and its link to political socialization in the digital age • Open discussion on the shift in patterns • Official information campaigns to revert the presumed "banalization" of the voting act
Campaign concerns ▪ Political parties occasionally become worried that (remote) electronic voting can affect their campaign routines and change the composition of electorate.	• Remote e-voting should be branded as a neutral citizen service by election authorities • Enough time for debates, consultations, and demonstration of the system for political parties to avoid politicization has to be granted

Stakeholders' scepticism ▪ Sometimes there is fear and distrust towards the voting technology among the stakeholders who perceive it as not enough secure, transparent, and verifiable.	• Competence building and knowledge generation among stakeholders • Certification by trusted third party • On-going and continuous independent auditing and system testing • Profound project evaluation
Lack of overall trust ▪ In many cases there is a lack of citizens' trust in the institutions (vendors, EMBs, politicians in general) involved in different aspects of the e-voting process.	• This lack of trust in e-voting partners belongs to a broader trend of weakened linkage between citizens and government authorities • Estimate where the country stands in terms of maturity of the political system and the level of trust in democracy • Voter information and education • Independent auditing and evaluation • Open source code or possibility to review source code of the system in use • A sufficient legal basis
Dematerialization of votes ▪ The inability to see and touch the ballot and fully control the vote casting act during remote e-voting adds to the overall suspicion and speculation.	• Postal voting poses similar constraints on the voting process • The procedures performed with the paper ballots after the closing of the polling stations are in certain democracies in a way "invisible" too • Technology providers should share the secure framework and demonstrate transparency to the public • The system is reliant on the commitments of voters to cast independent, free, and fair ballots and on the actions EMBs take to follow accepted practices

The discussion of the attitudinal problems presented above can be generalized into the following strategic implications:

1. **Development of political maturity;**
2. **Adoption of best practices in management.**

First, it is a fact that electronic voting in political elections is highly dependent on the specific socio-political climate and overall indicators of democratic maturity of the society. There is an opinion that much of the present discussion about the potential "trivialization" effects of remote e-voting is an evidence of the lack of political growth and maturing. In other words, as argued by Barrat (2006), "this strong defence of the

current electoral routine is a direct consequence of the systems' weaknesses". That is why in the situation of stakeholders' scepticism it is worth considering how the value of voting using a remote medium can be reinforced using e.g. public information campaigns and voter education. To date the discussion of the negative impact of electronic voting on the traditional political values prevails. Thus there needs to be an alternative discourse discussing what it means from the civic point of view to cast the vote electronically. An open and inclusive public debate on the benefits and risks of the electronic voting option should be fully encouraged and supported by all necessary means.

Second, the overall public attitude towards an e-voting project does not depend exclusively on the given level of political maturity in the society and among the stakeholders but is reliant on the management and administration practices executed by election authorities. There is no need to argue that transparency and impartiality for the sake of trust building should be one of the core values throughout the whole implementation process; but it is though worth mentioning that following best practices from the planning to evaluation stages can save up a lot of efforts and help avert some serious problems. This includes but is not limited to independent auditing by third parties, e-voting system certification, and comprehensive evaluation of the project.

4. Recommendations

The aim of this research was to look into ways how some of the constraints associated with remote electronic voting can be better understood and possibly mitigated. In the present study a classification model is used depicting the multitude of challenges to a more successful e-voting implementation as a three layer pyramid (Figure 1). The solutions to the identified problems at each of the three levels are presented as tactical measures paired with each of the challenges (see Tables 1-3). These solutions can be aggregated in the following strategic agenda recommendations:

1. Implementation of a remote electronic voting solution must be preceded by a holistic and integrated project planning including e.g. feasibility studies, cost-benefit analysis, system testing.
2. There is a need to set up instruments to support efficient capacity building and knowledge sharing among practitioners in the field.
3. More resources should be allocated for professional training and education for members of election commissions and authorities as well as other personnel involved in e-voting projects.
4. Remote e-voting can benefit from closer integration with other electronic services due to increased cost-efficiency, learning effects, and better acceptance.
5. It is a good practice that the development process of e-voting systems adapts to the target user audience with regards to demands, skills, and attitudes.
6. Fair risk assessment and rational concessions can be helpful in mitigating security concerns pertinent to remote electronic voting.
7. The level of political maturity in the society needs to be accounted for and actions to expose the value of electronic votes should be taken up.
8. The organizational routines in e-voting projects need to be improved with the view of enhancing their transparency and good management practices.

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