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E-VOTING – A KEY TO INDEPENDENCE FOR ALL

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Abstract: The paper addresses the experience of Estonia in strengthening democracy through the use of information and communication technologies (ICT) to bring decision-making closer to the citizen. The presentation focuses on e-Voting and enhanced use of ICT in democratic practices as key elements in achieving independence for everyone, disabled persons included. This paper draws on the analysis of secondary sources of development of information society and e-Voting in Estonia. Also the results of a pilot study testing accessibility and usability of e-Voting environment for visually disabled people during the advance voting of parliamentary elections in March 2007 are covered.

Keywords: e-Voting, e-Democracy, e-services, ID card, accessibility, usability

1. Introduction

Internet voting has intrigued people's interest as being a modern and contemporary alternative to traditional elections. The introduction of Internet voting also serves the goal to bring people to vote by enlarging the accessibility. This is why Internet voting offers an alternative for citizens who are ill or disabled.

The aim of the paper is to introduce the experience of Estonia in e-Voting and to concentrate on the importance of e-Voting for the disabled persons to guarantee their independence for election participation

In the paper the following questions are addressed:

- Development of information society in Estonia: major landmarks and policy documents;
- Development of e-services in Estonia: major ICT projects;
- Estonian e-Voting project: e-Voting during local elections in October 2005 and in parliamentary elections in March 2007
- Principles of e-Voting and prerequisites required for e-Voting;
- The results of the pilot study testing accessibility and usability of e-Voting environment for visually disabled persons

The issue of Internet voting or e-Voting has increasingly become a topic among political commentators and political scientists. Researchers (Alvarez & Hall 2004; Coleman 2002; Loncke & Dumortier 2004; Mendez & Trechsel 2005) have focused on the political and legal issues related to e-Voting, the aspects of designing e-Voting systems have been less covered.

The paper deals basically with practical issues, addressing the aspects of e-Voting related to information technology and provides a short introduction to some of the social aspects of e-Voting. The paper draws on the analysis of secondary sources of development information society and e-Voting in Estonia (incl. official documents of the Ministry of Economic Affairs and Communications and National

Election Committee). The conclusions are based on the pilot study of testing the accessibility and usability of e-Voting environment for visually disabled people during the advance voting of parliamentary elections in March 2007.

2. Definition of Terms

The paper examines enhanced use of ICT in e-Democracy in Estonia focusing on e-Voting.

- **Internet voting.** Two main types can be distinguished: polling place Internet voting and remote Internet voting. In Estonia remote Internet voting was used.
- **Remote Internet voting system** uses unsupervised Internet voting computers to cast a ballot over the Internet, using a computer not necessarily owned and operated by the election personnel. This system requires electronic (for instance digital) authentication: the voter will need a personal key (password, digital signature) to identify himself as a legitimate voter (Loncke & Dumortier 2004).
- **E-Democracy** consists of all electronic means of communication that enable/empower citizens in their efforts to hold rulers/politicians accountable for their actions in the public realm (Mendez & Trechsel 2005).
- **ID card** - personal identification document, which is legally accepted for digital identification and for digital signing of documents. The ID card is a document for domestic use and is mandatory for all Estonian citizens over 15 years of age and permanent resident aliens.

In this paper the terms e-Voting and Internet voting are interchangeably used to denote voting via the Internet.

3. Development of information society in Estonia

Estonia is considered to be a leading country when it comes to the use of ICT-technologies and the Internet in the private as well as in the public sector. Estonia is the only country in Europe where access to Internet is legislated as a social right. 65 per cent of the population are Internet users, 53 per cent of households have a computer at home and 90.3 per cent of these computers are connected to the Internet (Survey "e-Monitoring", TNS EMOR March-May 2007). Additionally, there are 750 public Internet access points in Estonia and all Estonian schools and public libraries are connected to the Internet.

Estonia has adopted a progressive ICT-policy and there is much experience in the use of the means of e-Democracy (such as e-Voting, e-Consultation, e-Forums). During the local elections in October 2005, Estonia became the first country in the world to hold countrywide public elections where people could cast their vote electronically, using the secure ID card as an authentication mechanism. Estonia is the only country that used e-Voting also in parliamentary elections in March 2007.

3.1 Major policy documents

The developments of Estonian information society have been influenced by the three most important regulations. These are the Principles of Estonian Information Policy, passed in May 1998, the Public Information Act, passed in November 2000 and Estonian Information Society Strategy 2013, passed in November 2006.

In ***Principles of Estonian Information Policy (PEIP)*** strategic goals of an information society development in Estonia were first defined. One of the strategic goals set by the PEIP was the use of ICT for promoting and strengthening democracy. Special attention was paid to the free and equal access to public information. New development programme *Estonian Information Society Strategy 2013* entered into force in January 2007. It takes into account also the objectives and priorities of the EU information strategy 2010 and in addition to the technical aspects of information society pays also attention to the social aspects.

Public Information Act ensures that the public and every person have the opportunity to access information intended for public use. After it entered into force in January 2001, it has made public

institutions to provide more information on their web pages and thus the whole public sector has become more transparent.

Estonian Information Society Strategy 2013 is a sectoral development plan, setting out the general framework, objectives and respective action fields for the broad employment of ICT in the development of knowledge-based economy and society in Estonia in 2007-2013. Estonian Information Society Strategy 2013 is the first policy document of information society where particular attention is paid to the integration of social groups with special needs. In order to implement this policy, the strategy foresees for bringing public sector websites into compliance with WAI criteria so as to ensure their accessibility for all, including people with special needs.

3.2 Major ICT programs and development of e-services in Estonia

The enactment of **Public Information Act** also became the basis for several national ICT programs and projects. These programs and projects are mainly dealing with the modernization of the communication within the government, or with provision of services to companies and individuals on digital databases (such as ID card initiatives, e-Tax Board and e-Citizen project). These public sector initiatives aim at creating a better online environment for the citizens for strengthening democracy. For using e-services either the identification systems of private banks or ID cards can be used.

The **ID-card** constitutes a safe means of using e-services. Upon the issue of ID card a person is given two PIN codes. PIN 1 is meant for digital identification of a person and PIN 2 for digital signing. In Estonia digital signature is legally equivalent to a handwritten signature. PIN codes and PUK code necessary for the electronic use of the ID card are known only to the owner of the card, the codes are issued in a safety envelope together with the ID card. Relying on the data of the Certification Centre to date (May 2007) there are approximately 930 000 ID cards in active use in Estonia.

The **e-Tax Board** enables the taxpayers to communicate with the Tax and Customs Board quickly, easily and safely. In 2006 86 per cent of all income income-tax returns were submitted using e-Tax Board, 94 per cent of the clients having submitted their income-tax return through the e-Tax Board received their overpaid sums after the initial check from the Board within five business days.

Project e-Citizen is a nation-wide project for developing cooperation between Estonian citizens and the public sector through the Internet. The goal of the **Information portal** is to give practical information about the rights and obligations of the people living in Estonia. The Information portal offers forms, references to legal acts, useful web pages and e-services.

Project e-School is aimed to increase the engagement of the parents in the study process and school life providing them with an opportunity to follow the activities in school and to communicate with the teachers.

4. Development of e-Voting in Estonia

Since the beginning of this millennium, the introduction of e-Voting has been actively discussed in Estonia and a law from 2002 provided measures for preparing and implementing e-Voting. The development of e-Voting was closely linked to the development of the digitally enabled ID card. After passing the Identity Documents Act in 1999 and the Digital Signature Act in 2000, ID card became obligatory from 1 January 2002.

The aim of e-Voting is to provide the voters with an additional voting method and thus increase the voting activity of all population groups and make voting more comfortable and accessible.

The **prerequisites of e-Voting** are the following:

- The legislative basis for e-Voting had been established.
- The wide use of electronic ID cards.

Relying on the data of the Certification Centre to date (May 2007) the total number of ID cards exceeds 1 000 000. It means that almost all eligible voters are covered (for comparison according to

the data of the Statistical Office of Estonia the population of Estonia as at 1 January 2007 is 1 342 409).

The **first Internet voting** in the local elections took place during advance voting from October 10 to October 12 2005. Overall 9 317 voters (1.85 per cent of the participating voters) used e-Voting. The overall turnout at these elections was 47.4 percent. In parliamentary elections in March 2007 30 275 voters (5.45 per cent of the participating voters) used e-Voting. The overall turnout at these elections was 61 per cent.

4.1 Basic principles of e-Voting

The main principle of e-Voting is that it must be as similar to traditional voting as possible, compliant with election legislation and principles and be at least as secure as traditional voting. From a technical point of view the e-Voting system must be as simple as possible as well as transparent.

The following principles are specific to e-Voting:

- **For voter identification ID-cards are used.** The ID-card is the only independent means of electronic communication which enables electronic personal authentication at a maximum security level and digital signature.
- **Possibility of electronic re-vote.** e-Voter can cast his/her vote again and the previous vote will be deleted.
- **The priority of traditional voting.** Should the voter go to polling station on advance voting day and cast a vote, his or her electronically cast vote shall be deleted.

5. Importance of e-Voting for the disabled voters

Several authors have stressed the importance of e-voting for the disabled persons. Coleman (2002) has noted that online voting via the internet could offer increased accessibility to electors with visual impairments. Loncke and Dumortier (2004) have stressed, among other advantages of e-voting, that online voting system may increase voter turnout by making the elections more convenient and more accessible to disabled voters.

In order to answer the question whether the Estonian e-voting system allows the visually impaired persons to participate in the elections independently Estonian Foundation for the Visually Impaired arranged a pilot study during the advance voting of parliamentary elections in March 2007 in order to assess whether e-voting environment is accessible and usable for the visually impaired voters.

The pilot study had two aims: firstly to assess the accessibility and usability of e-voting interface for the visually impaired with screen reading software and to make suggestions for the National Electoral Committee for the adjustment of e-voting interface so as to make the use thereof more convenient and easily accessible for the users of assistive software and secondly to introduce the visually impaired with the e-Voting option via participation in the advance voting of the parliamentary elections.

5.1 Methodology of pilot study and limitations

The pilot study was carried out from 26 to 28 February 2007 in the EFVI's computer class, while PCs there were equipped with the software and hardware required for the participation of the visually impaired in the e-Voting.

An e-voting could be accessed by visually impaired people from any computer which has:

- A chip card reader with the relevant software (software for using ID card);
- Internet connection;
- Windows, Mac OS or Linux operating system;
- Special software – screen reading software.

In order to participate in the e-voting, a person must have an ID card with valid certificates and two PIN-codes thereof.

It is important to note that as according to Estonian election legislation e -Voting takes place only from the 6th to 4th day before the Election Day, the use and testing of the e-Voting environment during the advance voting was possible only during the three days from 26 February to 28 February. During that limited time the testing of the accessibility and usability of the e-Voting interface by the visually impaired experts took place and introduction of e-Voting procedure via TV both for the visually impaired persons as well as for the general public.

The methodology of pilot testing was essentially influenced by the fact that the Riigikogu Election Act does not provide specifications or minimum prerequisites of the internet voting system, nor the obligation to test the system. Although e-Voting system was tested two weeks prior to the 3-day advance e-Voting period by the public (4 000 voters), this test focused only on the operation of e-Voting interface and was not based on the pre-determined evaluation criteria (as these have not been developed in Estonia).

For the assessment of the accessibility and usability of the e-Voting environment the visually impaired experts covered the whole e-Voting procedure step-by step, mapped all problems that emerged during the process and found solutions for the problems so that in conclusion the final aim could be accomplished – to give their vote during the parliamentary elections by e-Voting procedure.

The passing of the e-Voting procedure by experts using screen reading software JAWS v 6. and JAWS v 7. included the following steps:

- To identify how to plug in ID card into the card reader.
- To check the validity of the ID card certificates.
- To update the expired certificates if necessary.
- To vote electronically go to the web page of the National Electoral Committee and identify himself or herself using first personal code (PIN 1) which enables digital identification.
- After identification, the consolidated list of candidates in the electoral district of the residence of the voter was displayed to the voter on the web page.
- To get acquainted with the construction and logic of the e-Voting environment.
- To learn how to find on the web page the candidate in the electoral district of his or her residence for whom he or she wishes to vote.
- To learn how to highlight the candidate for whom he or she wishes to vote.
- To learn how to cast the vote by using the second personal code (PIN 2).
- To identify an on screen confirmation that the vote has been cast.
- To learn how a voter may change his or her electronic vote during the advance voting period (from 6th to 4th day before Election Day) by voting electronically.

5.2 The results of the pilot study

The e-Voting interface was provided through the Voter Application via an internet browser. Experts using Microsoft Windows opened the internet web page http://www.valimised.ee with their browser. This web page was easily accessible, as the standard key combinations of the browser and screen reader could be used. Using an e-Voting interface was very complicated as the standard key combinations of the screen reader didn't function in the e-Voting environment.

The following steps were the most complicated while passing through the e-Voting procedure:

- How to identify the layout of the e-Voting interface.
- How to navigate so that the name of the selected candidate would be highlighted.
- How to vote for the selected candidate.
- How to confirm one's choice (to cast the vote) by using personal PIN 2 code.

The experts had to find solutions to the above problems immediately and building thereon, specific guidelines were developed within the process of the pilot test for the visually impaired e-voters using the screen reading software. According to the expert opinion the problems related to the e-Voting interface accessibility that emerged during the testing were caused because e-Voting environment was not created using standard web environment design approaches. Due to using dissimilar solution the voter with visual disabilities could not use standard key combinations of screen reading software in order to identify the content of the page, to highlight the name of the selected candidate and to confirm his or her selection.

5.3 Improving the accessibility and usability of e-Voting interface

Relying on the results of the pilot study of accessibility of the e-Voting environment the suggestions to the National Electoral Committee of the Republic of Estonia and to the developer of e-Voting system were made in order to make the e-Voting interface used in Estonia more accessible and usable.

The main suggestion was to use valid WAI standards for the development of the e-Voting interface so that standard key combinations of screen reading software and screen enlargement software could be used in the e-Voting environment for navigation. Specifically, the following would be beneficial in the e-Voting environment:

- To provide the list of parties participating in the elections using links listing so that only the candidate list of the relevant party is opened by clicking the link of the appropriate party.
- Since only one option is possible for selecting a candidate, the candidate list could be displayed by using radio buttons.

Another suggestion was that prior to each election the full scale test of the e-Voting system is performed, engaging also visually impaired experts who will perform the test of e-Voting interface using assistive software. The need to perform the full scale end-to-end test on the entire e-Voting system was also one of the suggestions of OSCE (OSCE/ODIHR 2007).

6. Conclusions

Testing the accessibility of e-Voting environment and the use of e-Voting procedure by the visually disabled experts demonstrated that e-Voting as an alternative voting option has a potential to offer new possibilities for the disabled people for election participation. Upon the observance of the suggestion of the pilot test to use valid WAI standards for the development of the e-Voting environment by the developer the e-Voting environment becomes easily accessible for the visually impaired and guarantees independence and secrecy of the voting decision. Presumably it helps to increase the number of the persons with visual impairment who participate in the local and parliamentary elections using e-Voting. The comprehensive testing of the e-Voting system engaging visually impaired experts before the elections helps to avoid a situation where the problems related to the accessibility of e-Voting interface become evident only during the process of e-Voting.

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