E-voting in Estonia 2005. The first practice of country-wide binding Internet voting in the world

Ülle Madise[1,2], **Tarvi Martens**[1]

[1] National Electoral Committee
[2] Tallinn University of Technology
Lossi plats 1 a
15165 Tallinn Estonia
ylle.madise@riigikontroll.ee
tarvi@sk.ee

Abstract: At Estonian local elections in October 2005 for the first time in the world binding country-wide remote Internet voting took place: whole Estonian electorate had a possibility to cast the vote via Internet. Approximately 2 % of actual voters made use of this possibility. The e-voting surveys show that the attitude of the Estonian public toward e-voting was and is positive; gender, income, education, type of settlement and even age are no important factors by choosing e-voting from all voting channels; the use of e-voting possibility depends mostly on the trust in the procedure of e-voting and E-voting in itself does not produce any political effects. Estonian e-voting experience in 2005 reassures the hypothesis that e-voting does not raise the voting activity of people who never take part in elections, but it can encourage the participation of voters who vote sometimes. Thus, e-voting could slow down the trend of falling participation. Despite successful e-voting experience in October 2005, the political debate around e-voting has started in Riigikogu (Estonian Parliament) again. If the e-voting provisions will not be excluded from the law, the next country-wide e-voting in Estonia is taking place February-March 2007 by next Riigikogu elections.

1 Background

Estonia is widely credited to be a pioneer in e-governance and e-democracy. The use of digital channels for different services is steadily widening, nearly half of households have a computer at home and more than 4/5 of those are connected to the Internet. There are 55 public Internet access points per 100 000 inhabitants and all schools are connected to the Internet. Estonia is the only country in the world, where ID card with remote identification and binding digital signature functions is compulsory whereby ~70 % of Estonian inhabitants are already cardholders.[1] Therefore introducing e-voting[2] was a logical step to take and e-voting could be seen as an essential convenience in an information society, like using Internet for sending tax declaration etc.

The declared aim of the launching of online voting was to increase voter turnout and fight against political alienation. The participation rate at local government council elections in Estonia is usually ~ 50 % and at parliamentary elections ~ 10 % higher. The voter turnout did not exceed 70 % even at the constitutional referendum in 1992. So, the problem of low turnout really exists in Estonia. Since especially young voters' turnout is expected to rise, the most active supporters of e-voting are those parties, who hope to gain additional votes from an increased turnout. The angriest opponents seem to be those parties, who would probably lose their position in respective representative bodies that are composed on the principle of proportionality.

2 Theoretical fears and threats

The political agreement to introduce e-voting in Estonia beginning at 2005 elections was made in 2002[3]. In the discussion about introduction of e-voting classical arguments about conformity of the e-voting with the principles of fair elections incl reliability of electronic voting systems were changed, whereby one of typical arguments against e-voting was that people who have no commitment to go to the polling station to execute their citizen's duty, should not participate in governing at all, which attitude contradicts to the axiom that the higher the turnout is the better. The threats and fears around e-voting can be divided into two major groups:

- Purely political fears: some parties are afraid that the possibility to e-vote brings some people to vote, who otherwise would not participate. If those, who otherwise would not participate, would vote, the position of those parties, whose supporters prefer traditional voting in the polling station (or if said directly: who are ready to go to the polling station), could worsen. This fear is based on the assumption that possible e-votes are not divided proportionally between the parties;

---

[1] See the ID-card webpage in English: http://www.id.ee/pages.php/030301 [accessed on 01-05-2006].
[2] The public in Estonia is used to the meaning of e-voting explictely as Internet voting: other means of the electronic voting like a punch-card, optical scan ballot etc have never been seriously considered, therefore not known by the public. So the use of the notion "i-voting" would cause confusion.
[3] See about the genesis of the Estonian e-voting project in: [DM04]

- Possible lack of legitimacy of the election results because of following:

    - The individual e-voting procedure can not be supervised by authorities or observed in a traditional way, therefore massive buying and selling of the votes as well exercise of other influence or pressure on the voter are possible;

    - E-voting results can not be verified by the people themselves, and people need to have an absolute faith in the accuracy, honesty and security of the whole electoral apparatus (people, software, hardware). Thus, for people who didn't program the system, the operations of the computers can truly be verified only by knowing the input and comparing the expected output with the actual outcome. Under a secret ballot system, there is no known input, nor is there any expected output with which to compare electoral results.

Certainly it is important to realize, that legitimacy of e-voting or the elections results in whole can be challenged for purely political or personal reasons by some politicians, cryptographs or other opinion leaders without any objective cause.

2.1 Technological point of view

Risks of e-voting must be analyzed from different viewpoints, starting from the general public level and proceeding to more technical issues. There are a large variety of risks on each level; in this paper we will focus on the most principal and important ones. From the general public viewpoint, the major risks of e-voting include the following:

- Incorrectness or untrustworthiness of the voting results, which remain unnoticed at the time of elections (for example, voters are illegitimately influenced, multiple votes from one person are counted, a wrong vote is counted and so on).

- Breach of the voter's anonymity (for example, a person's political preferences will be presented to the general public).

- Annulment of the elections, interruption of the voting process (for example, due to a major security breach in e-voting).

From these three risks, the first two are the most serious. Annulment of the elections may be expensive, but tends to be politically less sensitive.

On the technical level these major risks are especially critical due to three principal problems of e-voting. Historically, one of the primary arguments has been that the security requirements of e-voting are extremely difficult to satisfy due to the conflicting requirements of confidentiality and auditability. The confidentiality requirement states that votes must remain anonymous; the auditability requirement - that every action in the system must be recorded.

A major argument against Internet e-voting states that Internet is an inherently insecure platform. Indeed, various attacks including worms, viruses, spy ware, spoofing, denial of service and others, can be used to compromise the voting results, to break the voter's anonymity, or to interrupt the elections. The vulnerabilities behind these attacks arise from the fundamental properties of the architecture of Internet and current personal computers. It has also been noted that (seemingly) successful e-voting trials do not really prove security of Internet voting. First, it is very difficult to prove that no security breach has occurred; and second, successful trials cannot eliminate security risks for future elections.

Finally, due to these and other problems the e-voting is sometimes argued to be not cost-effective: security measures complicate the election process and the small number of e-voters does not justify the additional costs resulting from this complexity.

2.1 Legal point of view

According to the Estonian Constitution members of the *Riigikogu* as well local government councils shall be elected in free elections based on the principle of proportionality, elections shall be general, equal and direct, and voting shall be secret. There is no special regulation for e-voting in the constitution. It is absolutely clear, that remote Internet voting makes it impossible, to guarantee privacy by the voting act. On the other hand, the required principle of uniformity gives rise to questions about equal access to participate in the voting process and additionally general equality issues.

3 Experience

3.1 Legal solutions

The principle of secrecy consists of the sub-principle of privacy and anonymity (secrecy of the election decision). Remote Internet voting requires in the first line rethinking of the principle of privacy. Voting in privacy should not be regarded as an aim by itself. The principle of secrecy, and its sub-principle of privacy, is there to protect an individual from any pressure or influence against her or his free expression of political preference. So it is a mean for guaranteeing freedom of choice. Such teleological approach to the constitution was the basis of the e-voting provisions from the very beginning of the whole project. [DM02] If we can not use compulsory privacy for guaranteeing the principle of freedom to vote, we must find an another method. The Estonian election law gives the e-voter the right to alter the vote given by electronic means with another e-vote or paper-ballot whereby the paper-ballot has priority. So a “virtual polling booth” is created: the e-voter can choose the moment, when she or he is alone, free of any possible pressure. On the other hand it is an efficient instrument against purchasing of votes. The e-voters possibility to change their e-vote reduces the motivation to exercise any influence or pressure including offer money or goods for any votes.

In Estonia, other that in some countries, the fact whether a person entitled to vote did participate in voting or not, is not regarded as a part of the principle of secrecy. The voter lists that contain information about participation and chosen voting method are preserved in the archive and can be used for research purposes. Researchers have made use of this possibility; incl for the e-voting survey, what unfortunately weakened somewhat the public trust against e-voting. The fact that the official questioner had knowledge about the actual fact of e-voting made some people suspect about the secrecy of their voting decision. These suspicions were leaked in public media but they were more or less kept unmarked. The explanation was that voters' lists have always had according information about who participated and what voting method was used. The voting decision itself has always been secret.

Some months before the municipal elections 2005 the President of Estonia brought e-voting provisions to the Supreme Court for constitutional review arguing that the possibility to change e-votes gives advantages to e-voters in comparison to non-e-voters. E-voters can change their vote for an unlimited number of times but only during e-voting and advance poll days (from sixth to fourth day before actual voting day, i.e. from Monday to Wednesday). The initial version of the e-voting law contained the possibility to change the e-vote with a paper-ballot on the actual voting day. This provision was left out of the law, because this could have given real advantage to e-voters: they would have had the chance to change their election preference on Sunday after receiving additional information about candidates in the second half of the week. After this change all voters who use advance poll possibilities are formally in the same conditions.

The Supreme Court Chamber of Constitutional Review pointed out that despite the repeated electronic voting the voter has no possibility to affect the voting results to a greater degree than those voters who use other voting methods. From the point of view of the voting results this vote is in no way more influential than the votes given by paper ballot. According to the Estonian Election law[4] each voter shall have one vote. When a voter has given several votes electronically, the last vote shall be taken into account. If a voter has voted both electronically and by a ballot paper, the ballot paper shall be taken into account. Within the system of electronic voting the taking only one vote per voter into account is guaranteed by a system similar to the so called system of two envelopes, used upon voting outside the polling station of one's residence during advance poll days.

Upon voting by electronic means a voter makes her or his choice, which shall be encoded (placed in a so-called virtual inner envelope). Thereafter the voter shall approve the choice by his or her digital signature, which means that personal data is added to the encoded vote (so-called outer envelope). The personal data and the encoded vote shall be stored together until the counting of votes on the Election Day, with the aim of ascertaining that the person has given only one vote.

[4] See the e-voting provisions in [MVM06]

The personal data of a voter and the vote given by the voter shall be separated after the fact that the voter has given only one vote has been checked and repeated votes have been eliminated. It is possible to open the so-called inner envelope only after the personal data added to the encoded vote have been separated with the help of a key given only to the members of the National Electoral Committee, after the polling stations have been closed. Thus, the system of electronic voting guarantees that only one vote per voter shall be taken into account, ensuring, at the same time, that the voting decision remains secret.

Pursuant to the petition of the President the violation of uniformity of voting also consists of the fact that through the possibility to change the e-vote given for unlimited number of times gives advantage to the e-voters in comparison to other voters; That because other voters do not have the possibility to change their vote. The Chamber said that this interpretation renders the principle of uniform elections a special case of general right to equality. In the legal sense e-voting is equally accessible to all voters. The ID-card necessary for e-voting is mandatory for all inhabitants of Estonia, thus, the state has created no legal obstacles to anyone to e-voting, including to changing one's vote during the advance poll days. It is a fact, that due to factual inequality the possibility to change one's vote through e-voting is not accessible to all voters can be regarded as an infringement of the general right to equality and the principle of uniformity. The principle of equal treatment in the context of electing representative bodies does not mean that absolutely equal possibilities for performing the voting act in equal manner should be guaranteed to all persons entitled to vote. In fact those who use different voting methods provided by law[5] are in different situations. The guarantee of absolute actual equality of persons upon exercising the right to vote is infeasible in principle and not required by the Constitution. The aim to increase voter turnout is without any doubt legitimate. The measures the state takes for ensuring the possibility to vote for as many voters as possible are justified and advisable. Another aim of allowing e-voting is the modernization of voting practices what coincides with the aims of e-voting listed in the Recommendation (2004)11 "Legal, operational and technical standards for e-voting" of the Council of Europe.

In accordance with the Penal Code, preventing a person to freely exercise his or her right to elect or be elected at an election or to vote at a referendum, if such prevention involves violence, deceit or threat or takes advantage of a service, economic or other dependent relationship of the person with the offender is punishable by a pecuniary punishment or up to one year of imprisonment. The voter's possibility to change the vote given by electronic means, during the advance polling days, constitutes an essential supplementary guarantee to the observance of the principle of free elections and secret voting upon voting by electronic means.

---

[5]The voting methods allowed in Estonia are: advance poll with paper ballot in- and outside of the polling station of voters' place of permanent residence from 13th to 4th day prior election day; postal voting from abroad; voting at the Estonian Embassies in foreign states; home voting on election day; voting in custodial institutions and hospitals; voting on an Estonian ship, electronic voting from 6th to 4th day before election day and voting with paper-ballot on election day. At local elections not all of them are allowed.

A voter who has been illegally influenced or watched in the course of electronic voting can restore his or her freedom of election and the secrecy of voting by voting again either electronically or by a ballot paper, after having been freed from the influences. In addition to the possibility of subsequently rectifying the vote given under influence, the possibility of voting again serves an important preventive function. When the law guarantees a voter, voting electronically, the possibility to change the vote given by electronic means, the motivation to influence him or her illegally decreases. There are no other equally effective measures, beside the possibility to change the vote given by electronic means, to guarantee the freedom of election and secrecy of voting upon electronic voting in an uncontrolled medium. The infringement of the right to equality and of uniformity, which the possibility of e-voters to change their votes for unlimited number of times can be regarded as amounting to, is not sufficiently intensive to overweigh the aim of increasing the participation in elections and introducing new technological solutions.[6]

3.2 Did voters' turnout increase?

It is very difficult to measure, whether e-voting did influence actual participation rate. Analysis based on facts is impossible; the only way is to question voters and non-voters, especially e-voters whether they had cast their e-vote if the possibility to e-vote would not have existed. E-voting at local government council elections started on 10 October 2005 at 9 am and ended on 12 October 2005 at 8 pm on the web page www.valimised.ee. The e-voting turnout was ~2 % of actual voters, what was estimated as a good result. The research confirms that e-voting will probably not bring those people who principally do not participate to vote. If e-voting does increase turnout then only within those groups of voters, who sometimes vote and sometimes not.

According to the subjective estimation of participation in the absence of e-voting, 4,9% of the questioned e-voters gave the answer that they would certainly not have voted if e-voting would not have been offered; 13,6% gave the answer "probably would not have" [BT06]. According to the proportion of those, who vote in some elections or from time to time, among e-voters and voters at polling station, we see, that 29,2% of e-voters and 21,5% of voters voting at polling station belong to that group [BT06]. So, slight increase of turnout may still be possible. Postal voting is not allowed at local elections. Therefore it is possible, that some Estonian inhabitants living or working in foreign countries could have cast their vote only because e-voting was offered. According factual data unfortunately does not exist.

[6] Decision Nr 3-4-1-13-05 from 1. September 2005 of the Chamber of Constitutional Review of the Estonian Supreme Court. Resume in English in: [MVM06]

The number of persons eligible to vote	1.059.292
The number of votes:	502.479
Valid (incl e-votes)	496.345
Invalid	6.134
Turnout	47%
Total number of e-votes	9.681
The number / of amended repeat e-votes (more than 1 vote per voter)	364
The number of e-voters	9.317
The number of e-votes eligible for counting	9.287
The number of annulled e-votes	30
The % of e-votes amongst all votes	1,87%
% of voters who voted during pre-voting days (incl e-voters)	12%
% of e-voters among all voters who voted during pre-voting days	7%
The number of voters who used ID-card electronically for the first time (for e-voting)	5.774
The % of those, who used ID card for the first time electronically among all e-voters	61%

Figure 1: General statistics of local government elections 2005
(data: National Electoral Committee)[7]

Most popular e-voting times were in the very beginning and in the very end of the e-voting period: in the morning at 9 and in the evening at 19 (probably at the time when people got to their workplace or in the evening at home). During the whole e-voting period, the number of e-voters was the largest at the beginning of the voting period and even larger during the very last hour of e-voting [MVM06]. Most e-votes were given at home (according to the survey 54,5 %); 36,6 % at workplace; 3,6 % at a friends place, cybercafé etc; 3,2 % at a public Internet access point and 1,9 % at the bank office [BT06]. The question, whether the fact that one's colleagues participate in e-voting does or doesn't motivate choosing e-voting or influence participation in general and whether it is good or bad for democracy, needs some further research.

	Women	**%**	**Men**	**%**
up to 29	1062	25,0	1512	30,0
30 - 34	542	12,8	908	18,0
35 - 39	506	11,9	688	13,6
40 - 44	497	11,7	553	11,0
45 - 49	451	10,6	433	8,6
50 - 54	362	8,5	345	6,8
55 - 59	278	6,5	228	4,5
over 60	547	12,9	375	7,4
TOTAL	**4245**	**100,0**	**5042**	**100,0**

Figure 2. Factual statistics about e-voters by age groups and gender

[7] More statistics at the National Electoral Committee web page: http://www.vvk.ee/english/results.pdf [accessed on 01-05-2006]

3.3 Non-discriminatory Access to the voting

The facts we do have, as well the results of surveys show that at the 2005 elections the problem of inequality in gaining representation because of e-voting did not exist. We are in the opinion that the digital gap increases social disparity in elections in today situation only if the number of voting stations decreases or the voting period will be abbreviated. Neither one nor another was the case by elections 2005. The principles of fair elections require formal equality of voting conditions, not material equality. It is generally impossible to guarantee strictly equal conditions for all voters: e.g. the polling station is for some people closer than to another. Therefore, the creation of new and more comfortable voting possibilities does not contradict to the constitutional principles of voting until we do not worsen the "old-fashioned" voting conditions. The most important reasons for not using e-voting were the absence of the Internet access and lack of computer knowledge (according to the survey 67,1 %). Approximately one-fifth of the questioned non-e-voters pointed out that a reason for not e-voting was the sufficiency of the paper-ballot system. Lack of trust with 3,2% and absurdity of e-voting with 1,9% were no dominant reasons [BT06]. Prior to the actual e-voting there was a concern that the possibility to change the e-vote is going to be misused. It was not the case. The general statistics shows that the number of amended e-votes was only 364 (see figure 1), including repeated votes given for demonstration by the members of the e-voting organizing-team. Gender is not an important factor when choosing e-voting from possible voting channels, age on the contrary is quite an important factor: most e-voters belong to the age group 18-29 (see figure 2). It is important to remark, that these age groups are not easily comparable: the age group of 18-29 is much bigger than the group of 30-34 etc.

The hypothesis that e-voting rewards advantages to urban electorate found no proof (see figure 3). When we look at the absolute number of e-voters by towns and rural municipalities, we can see that the largest number of e-votes was given in Estonian capital city Tallinn and in the second-large city Tartu. When we compare the percentage of e-votes with all votes cast in a municipality or town, it can be seen that at the top there is not Tallinn or Tartu but a tiny municipality, the island Ruhnu with 11.1%; neighboring municipalities of the capital city follow with ~4%. Tallinn ranks 15th and Tartu 29th, respectively with 2.75% and 2.42% of all votes. If we compare the percentage of towns and municipalities, the differences are not really great, with the exception of the county near the eastern border with Russian-speaking inhabitants. The exact reasons of e-voting turnout being so low in that area needs further research.

Among 240 districts, there were only 18 with no e-voters at all.

Type of settlement	**Type of political participation**			
	no vote	vote at polling station	e-vote	Total
Urban	67,9%	67,6%	70,2%	68,6%
Rural	32,1%	32,4%	29,8%	31,4%
Total	100,0%	100,0%	100,0%	100,0%
№ of respondents	(305)	(318)	(315)	(938)

Figure 3. Frequency of Political Participation and Mode of Vote in 2005 [BT06]

3.4 Political effects

The initiator of the e-voting project *Reformierakond* (Reform Party) received the most e-votes (32,7 % of all e-votes; the percentage of e-votes in all votes given to Reform Party is 3,61), all other parties supporting e-voting did also well (respective percentages by Pro Patria 17,5 and 3,82; Res Publica 10,4 and 2,29; Social Democrats 9,9 and 2,86). Among other things the Reform Party organized ID-card user trainings and handed out complimentary smart-card readers during their election campaign. Parties who challenged the e-voting until the actual voting time *Keskerakond* (Center Party) and *Rahvaliit* (Peoples Union) received quite few e-votes (8,7 % of all e-votes; the percentage of e-votes in all votes given to Center Party is 0,63; respective percentages by Peoples Union 6,9 and 1,03). Important reason for that can be the opposition towards e-voting among their supporters. The Centre Party who on the background of their general success could have received many e-votes ranked only 5th among the political parties by the number of e-votes. [MVM06]

Prof A. Trechsel and F. Breuer assessed the possible political impact of e-voting using the results of the telephone survey and concluded political neutrality of e-voting (see figure 4).

Independent variables	**B**	**s.e.**	**sig.**
Age	0,267	0,116	0,022
Gender	0,415	0,287	0,148
Settlement	0,361	0,316	0,254
Education	0,289	0,181	0,111
Income	-0,166	0,136	0,221
Language	**-1,377**	**0,546**	**0,012**
Left-right scale	-0,008	0,073	0,908
Political discussions	0,270	0,162	0,095
Trust in Parliament/government	-0,265	0,342	0,438
Trust in politicians	0,188	0,316	0,551
Trust in the State	0,516	0,278	0,064
Computing knowledge	**-0,410**	**0,181**	**0,023**
Frequency of internet use	0,153	0,082	0,063
Location of internet access	0,247	0,172	0,150
Trust in transactions on the internet	-0,325	0,229	0,156
Trust in the procedure of e-voting	**-1,684**	**0,244**	**0,000**
Constant	1,004	1,723	0,560

Figure 4. Multi-variate global model of the impact of socio-demographic and –economic, political and ICT variables on choosing e-voting over voting at the polling stations (logistic regression coefficients). [BT06]

3.5 Technical and Organizational Measures used to ensure security and trustworthiness of e-voting

The organizational issues involve many different aspects. The overall organization of elections, including preparation of initial data, timing of e-voting, collection of results, handling (multiple) e-votes, and other, must support e-voting processes adequately. In spite of somewhat virtual character of the e-voting organization that may not be easy to define and protect from the information security viewpoint, its actors, roles, and responsibilities must be defined, assigned, and managed. In Estonian case, the organizational procedures, including risk management, security procedures, and security awareness activities, were be clearly defined. All e-voting procedures were identified; critical procedures that can lead to major risks were documented and audited by an accredited IT auditor.

The e-voting system was designed to deal with conflicting requirements of confidentiality and auditability. The concept of "digital double-envelope" was used [GD05]. According to it, e-voting should be in a sense analogous to voting with envelopes at a traditional voting (paper-ballot given outside home voting station of the voter and postal voting from abroad). Implementation of this concept may include representation of the inner envelope by an encrypted vote and the outer envelope - by a digital signature.

The e-voting system is managed on several levels: software development and modification, installation and initiation, the active e-voting and subsequent activities. Relevant risk management, configuration management, change management, contingency planning, disaster recovery planning, safeguard selection and implementation and follow up procedures were defined and implemented. System and network monitoring was performed by different parties on different levels during the e-voting period on a 24h basis. All major e-service providers (e.g. banks) and Internet operators were involved in the process with monitoring the overall “health” of Internet – network traffic loads, analysis of possible Trojans/viruses etc.

As of result – no serious attacks occurred and the system was stable. Counting of e-votes was a semi-open procedure with presence of more than 60 international observers, journalists, IT auditors and members of the National Electoral Committee.

4 Conclusion

Estonian e-voting experience seems to prove that it is possible to solve the legal as well technological obstacles. The compulsory ID card with remote identification and digital signature functions as well IT auditors as the guarantee of public trust play a crucial role in the successful experience. The system of e-voting has worked perfectly, all procedures have been legitimate and performed lawfully (respective confirmation of auditors is available).

The attitude to the e-voting of the Estonian public was and is positive[8]. There were no court cases and we do not have any information about purchase of e-votes (on the contrary to the votes on paper-ballot). Here we should underline again, that voting in privacy in the remote unsupervised Internet voting context is a right, not a duty.

The legality and legitimacy of the whole election process has not been questioned for political reasons. One of possible explanations for that can be the public debate about the concept of the Principles of Honest E-Voting[9], what should be certainly continued. The principles of uniformity and generality in their conjunction require that the participation in voting, guaranteed to voters, is as convenient as possible. New voting channels, incl. e-voting serve the aim of increasing the participation in voting and thus protecting the representative nature of representative bodies. E-voting does not change the voting behavior of those persons who principally do not vote in elections, but it accords participation opportunity to the people who have no time or commitment to go to the voting station. Due to several new comfortable voting methods incl. postal voting and advance poll the traditional significance of the Election Day as voting day is anyway gone.

Literature

[BT06] Breuer, F.; Trechsel, A.H. Report for the Council of Europe. E-voting in the 2005 local elections in Estonia. European University Institute. Project leaders Prof.Dr. Alexander H. Trechsel, European University Institute, Florence, Italy & Director of the e-Democracy Centre (e-DC), University of Geneva, Switzerland; Ivar Tallo, Director of the e-Governance Academy, Tallinn, Estonia. Florence, 06.03.2006.

[DM02] Drechsler, W.; Madise, Ü. E-voting in Estonia. – TRAMES 2002, 3, vol 6 (56/51).

[DM04] Drechsler, W.; Madise, Ü. "Electronic Voting in Estonia." In Norbert Kersting and Harald Baldersheim, eds. Electronic Voting and Democracy. A Comparative Analysis. Basingstoke: Palgrave Macmillan, 2004, p 97-108.

[MVM06] Madise, Ü.; Vinkel, P.; Maaten, E. Internet Voting at the Elections of Local Government Councils on 16 October 2005: Report. http://www.vvk.ee/english/report2006.pdf [accessed on 28.04.2006]

[GD05] Estonian e-voting system - General description http://www.vvk.ee/elektr/docs/Yldkirjeldus-eng.pdf [accessed on 28.04.2006]

[8] Survey "e-voting and decreasing of political alienation". Faktum, December 2003;
Survey „The attitude of Estonian inhabitants toward e-voting", Faktum, February 2004;
Survey „The attitude of Estonian inhabitants toward e-voting", Faktum, February 2005;
E-voting Survey. Turu-uuringute AS, May - June 2005; Survey "Democracy and national interests". Faktum. October - November 2005.

[9] Available on the e-Governance Academy (eGA) web page: http://www.ega.ee/ [accessed on 28.04.2006]