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**Robert Schuman Centre for Advanced Studies**



**Report for the Council of Europe**

## **Internet voting in the March 2007 Parliamentary Elections in Estonia**

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## **Executive Summary**

### A) Background

This study presents and analyses the results of a survey among the electorate of the Estonian parliamentary elections held on 4 March 2007. The primary focus of the analysis lies on the newly introduced possibility of voting via the Internet in these elections. The application of this pioneering voting channel gave the elections an exclusive character and provoked enormous attention in the political as well as in the scientific community. The use of e-voting in the Estonian parliamentary elections is a remarkable *world-première*: for the first time an electorate could vote over the Internet in elections of a national parliament. Overall, 30.275 voters have used the possibility of e-voting, which corresponds to 5.4 percent of the participating voters.

The report is based on a specifically designed telephone survey, which was conducted among 987 Estonian voters who had the right to cast their ballot in the elections of March 2007. The sample comprises 367 e-voters, 365 “traditional” voters (voters who cast their vote at the polling place) and 246 non-voters (abstentionists). The report analyses what voting channels have been used by what type of voters and why they have chosen or refrained from using a particular voting channel. In addition, it informs its readers about participation patterns and political behaviour of the citizens. Furthermore, the data analysis and the report offer a dynamic perspective as they are able to provide some interesting comparative insights: in a previous report for the Council of Europe, a similar study was conducted analysing the use of e-voting in the country-wide 2005 local elections in Estonia.

Overall, Estonia is particularly suitable for the innovative use of e-voting and the introduction of this additional voting channel. Estonia is in general a forerunner in the use of the Internet and the Baltic country is in a leading position when it comes to the application of ICT in the private as well as in the public sector. The extensive use of ICT by Estonian citizens as well as by official bodies has developed a rather unique technological infrastructure, a broad technological knowledge base and a very positive attitude towards new technologies in Estonia.

This general infrastructure and the wide application and distribution of new technologies were perfect preconditions for the introduction of e-voting in Estonian elections. For some years, the introduction of this voting channel was discussed and various political, legal and technical preparations paved the way to the elections of March 2007. Following intensive political discussions, a successful pilot in January 2005 and the country-wide application of e-voting in the municipal elections in October 2005 prepared the eventual introduction of e-voting in the national parliamentary elections.

To cast their ballot in the elections of October 2007 by e-voting, the voters had to access the online ballot using their electronic ID-cards. These ID-cards, which are very widespread in Estonia, allow electronic personal authentication and digital

signatures and were a necessary precondition for the use of e-voting. The voters have to access a particular website and to introduce their electronic ID-card in a card reader, which is connected to the computer. This could be done six to four days prior to Election Day.

### B) Results of the survey analysis

Firstly, we investigated the importance of the Internet with regard to the campaign in the March 2007 election. We studied campaign engagement and sources of political information. We see that both voter and political parties are quickly adapting to Internet elections as well as the Internet as an information source. The political parties in Estonia are pushing information to voters on the Internet and many voters are using the Internet as a primary means of getting information about the elections.

When we looked at campaign information sources for voters, based on the mode of voting that they used, we found that in a number of important instances there were marked differences among voters based on the mode of voting they employed.

Specifically, Internet voters were less affected by traditional modes of political communication: they were less likely to have obtained information from radio, flyers and leaflets, political ads in papers and magazines, posters in the streets, party tents and outdoor events, or direct mail. The other major difference between Internet voters and polling place voters was that Internet voters were more likely to obtain election information online and to talk about the election with co-workers and family members.

Secondly, we focused on analysing the determinants of the decision to e-vote. Regarding the place of residence (rural or urban) of e-voters, there is no significant difference in the general participation pattern. This means that there is no major difference or bias between cities and the countryside. Regarding the locus of Internet voting, we found out that a large majority of e-voters cast their e-ballot from home or at their workplace. Only a very limited number of e-voters logged onto the system in order to vote from another place, i.e. a café, a friend's place, or a public Internet access point.

Considering voting behaviour by age and gender, it becomes clear that above all younger people participated by voting over the Internet. The use of Internet voting mobilises in particular young persons, while it is more seldom used by older voters. Regarding gender, male voters have been (slightly) disproportionately more mobilised by the possibility to vote over the Internet than was the case with their female counterparts.

Considering the potential impact of e-voting on the turnout in elections it is interesting that roughly one tenth of the e-voters would certainly or probably not have voted without having had the possibility to vote by Internet. However, the impact of this finding on the overall turnout is rather irrelevant. Given the fact that the e-voters made up only 5.4 percent of the participating voters (and only about 3.4 percent of

the eligible voters), this one tenth of e-voters has no significant impact on the overall turnout. Roughly calculated, the turnout would only have been 0.5 percent lower without e-voting. Should e-voting become more popular, however, and should this one-tenth of otherwise abstaining citizens turn out simply because e-voting was offered, the impact on turnout could become quite tangible. But this question will have to be addressed in the future.

The survey reveals that e-voting was above all perceived as a device that was convenient in that it made voting more speedy, practical and overall simplified participation. A huge majority of e-voters mentioned this reason as having guided their choice for voting over the Internet. Compared to the 2005 "*première*" of e-voting, in which almost one fifth of the e-voters indicated that the "kick of the first time" was the primary motivation for their e-vote, this proportion came down to less than 5 percent ("wanted to try" and "interesting, new, exciting") in 2007. In other words, this "first time curiosity" which we could show in 2005 was significantly reduced, as the "curious voters" might have become faithful to e-voting because the first experience in October 2005 was convincing to them.

While a huge majority of e-voters in 2005 saw e-voting as an unconditional utility in every electoral context, this is very different from 2007, where e-voters do not distinguish themselves anymore from non-voters and traditional voters in this category. Also, for more selective respondents, it is not the local level anymore which enjoys primacy over all other levels of electoral competition in which e-voting was seen as a desired device in 2005. Two years ago, within each category of voters and non-voters, if one did not necessarily favour a complete generalisation of e-voting, then it was the local level at which this device was seen most acceptable, respectively desired. The usefulness of e-voting is now affecting all forms of elections and referendums more equally. Finally, the formerly large number of non-voters and traditional voters indicating that they would "never" use e-voting has now drastically fallen by 50 percent.

Thirdly, the bi-variate analysis is extended by multi-variate models explaining the choice of the voting channel. In particular, we developed three partial models for explaining the choice of e-voting: a socio-demographic and economic model, a political model and an ICT model. Furthermore, we combine each of these individual models into an overall, global model for explaining the choice of the channel of participation.

Combining the three partial models into an overall model for the explanation of e-voting, the report offers some interesting results from which a number of fundamental conclusions can be drawn. When estimating the effects of all our independent variables at the same time, we find that many variables, that appeared to be of significance in the bi-variate analysis or in the partial models, lose their importance indicating the spurious nature of some of the observed correlations.

Considering our battery of socio-demographic and economic variables, education and income become insignificant. Age remains significant, but is now estimated to have a small positive effect on the decision to e-vote. Only language remains a strong predictor for the decision to e-vote. The fact that the e-voting procedure in the 2007 elections was solely in Estonian caused a very large part of the Russian speaking community to refrain from using this tool.

Political variables such as left-right auto-positioning, the frequency of political discussions, trust in parliament/government and in the state also turn out to be insignificant once controlling for ICT variables. Merely the trust in politicians seems to play an important role. A broad faith in the political leaders appears to foster the acceptance of new means of participation such as e-voting.

Focusing on the ICT variables, the main finding of the global model is that computing knowledge, trust in the procedure of Internet voting and frequency of Internet use can maintain their structural impact on the dependent variable and remain strongly significant. The results show that it is not so much the divide between “Internet access haves” and “Internet access have-nots”, but clearly their computing skills, faith in the e-voting procedure and Internet experience that made citizens choose either option of voting.

In the light of the report’s findings, the authors recommend to the Estonian authorities efforts to continue strengthening the information society so as to enable e-voting to become a permanent and universally accessible feature of Estonia’s political landscape. This should be accompanied by thorough technological monitoring which, in turn, would be facilitated by a robust and systematic certification of the e-voting system.

In order to make e-voting an inclusive tool, the Internet voting application and related information should also be proposed in Russian. The report commends the introduction in the 2007 e-voting system of a “help function” in Russian and English as a first step towards the implementation of this recommendation. The e-voting system could usefully be complemented by “electoral platforms” in order to increase citizens’ opportunities to participate in the electoral realm.

Finally, the authors reiterate their suggestion of 2005 to extend the duration of the Internet voting period so as to fully exploit e-voting’s potential to enlarge citizens’ freedom of choice with regard to the moment of voting, a major comparative advantage over voting at the polling station.

## 1. Introduction<sup>1</sup>

This report aims to analyse the results of a telephone survey on the parliamentary elections held in Estonia on 4 March 2007. The focus of the report as well as the survey lies on the possibility of casting a vote<sup>2</sup> via the Internet. This use of e-voting<sup>2</sup> in the elections to the *Riigikogu* (Estonian National Parliament) represents a true *world-première*: even though Internet voting has so far been used in local elections, in consultative decision-making processes, in private elections and in a number of formally binding referendums, the parliamentary elections in Estonia were the first time that the electorate of an entire country had the possibility to electronically cast its vote for electing a national parliament. Overall, 30.275 citizens used the possibility of casting their vote via the Internet. The present report seeks to analyse what voting channels have been used by what type of citizens and will inform its readers about both the participation patterns and political behaviour of citizens in these elections.

The specifically designed post-election telephone survey was conducted among 987 respondents of which 982 had Estonian citizenship.

The obtained data set allows us to conduct a significant analysis of various voting channels and the voting behaviour of the Estonian electorate. By analysing the participation patterns of the citizens we will be able to gain valuable insights on a number of relevant socio-political questions and the use of the Internet as a new voting channel. Furthermore, the data analysis and the report offer a dynamic perspective and are able to provide some fruitful comparative insights: in a previous report for the Council of Europe, a similar study analysing the use of e-voting in the country-wide 2005 local elections in Estonia was conducted by some members of the

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<sup>1</sup> We want to thank Dr. Andrew Glencross (EUI), Ivar Tallo, Zhanna Pilving and Nele Leosk (eGA, Tallinn) as well as Askur Alas (EKS Press, Tallinn) and Peeter Marvet (Tehnokratt, Tallinn) for their most valuable help and comments on our work.

<sup>2</sup> Technically, the term “e-voting” can describe stationary (as in voting booth) as well as remote (as in over the Internet) electronic voting. In the Estonian context and in this study, the term is exclusively used for remote internet voting.

present study team.<sup>3</sup> In order to allow for comparative insights, both the questionnaire and the sample of the survey were based on previously undertaken survey and study. This enables us to shed some light on the progress of e-voting, the development and possible change in voting behaviour and to draw conclusions on the introduction of this new voting channel from a time perspective.

This report is structured as follows: After this introduction, the second section of the report consists of an introduction to the social, legal and political context of the parliamentary elections held in March 2007. The goals of the study will be introduced in more detail in section three. Section four highlights the methods and the research management of the study, while the fifth section focuses on results concerning participation in the elections and some further general statistics. The sixth section of the report forms the most important analytical part of the study. It contains various analyses, both bi-variate and multivariate, of why Estonians chose (and respectively refrained from) voting over the Internet in the March 2007 parliamentary elections. Section seven summarises the main findings and section eight provides some general recommendations regarding the application of the Internet as an additional voting channel.

## **2 Context: E-voting in the Estonian Parliamentary Elections in March 2007**

### **2.1 Estonia and ICT in general**

In general, Estonia - which is often referred to as “E-stonia” - is without doubt a very progressive country when it comes to the use of the Internet and other ICT-technologies in both the private and the public sector. Amongst other things, Estonia is the only country in Europe where access to the Internet is legislated as a social

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<sup>3</sup> Breuer, Fabian./Trechsel, Alexander H. (2006) Report for the Council of Europe. E-Voting in the 2005 local elections in Estonia. See [http://www.coe.int/t/e/integrated\\_projects/democracy/02\\_Activities/02\\_e-voting/00\\_E-voting\\_news/FinalReportE votingEstoniaCoE6\\_3\\_06.asp#TopOfPage](http://www.coe.int/t/e/integrated_projects/democracy/02_Activities/02_e-voting/00_E-voting_news/FinalReportE votingEstoniaCoE6_3_06.asp#TopOfPage).

right<sup>4</sup> and, when assessed in GDP terms, Estonia is the world's leading spender on ICT.<sup>5</sup> Official programmes and policies encouraging the use of ICT and have put in place a strong technological infrastructure: 54 percent of the population are Internet users, 40 percent of households have a computer at home and 81 percent of these computers are connected to the Internet.<sup>6</sup> Overall, the use of the Internet and the access density is steadily widening; all Estonian schools are connected to the Internet and more than 750 public Internet access points are spread across the country. Income tax declarations can be made electronically via the Internet (in 2005, 76 percent of Estonian taxpayers declared their income tax via the Internet) and 72 percent of adult Internet users use online banking services. Expenditures made by the government can be followed on the Internet in real-time and already since 2000 cabinet meetings have been changed to paperless sessions using a web-based document system.<sup>7</sup>

Estonia's governing bodies actively support the development of a society using up-to-date information and communication technologies. The Estonian ICT-attitude and the striving for a strong information society is summarised in the following words by the Ministry of Economic Affairs and Communications: "the eagerness with which the Estonians apply up-to-date IT solutions clearly points to a high level of e-readiness in our people as well as to the conviction that modern technology can contribute to the construction of a better and more efficient society"<sup>8</sup> and the quote from the Estonian Informatics Centre: "in building e-State, Estonia has benefited from its small and adaptable population as well as a favourable starting point in terms of economic policy a decade ago."<sup>9</sup>

To reach this aim, "Principles of the Estonian Information Policy 2004-2006" were adopted in May 2004 to "strengthen the central IT co-ordination and increase

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<sup>4</sup> Already in February 2000, the Estonian Parliament approved a proposal to guarantee Internet access to each of its citizens, just like any other constitutional right. See [http://www.vm.ee/estonia/kat\\_175/pea\\_175/2972.html](http://www.vm.ee/estonia/kat_175/pea_175/2972.html).

<sup>5</sup> See presentation "Internet Voting in Practice" by Tarvi Martens [www.vvk.ee/english/tarvi0303.ppt](http://www.vvk.ee/english/tarvi0303.ppt).

<sup>6</sup> Survey "E-Seire", TNS Emor September-November 2005.

<sup>7</sup> Facts and figures taken from different surveys and official statistics. For an overview see [http://www.vm.ee/estonia/kat\\_175/pea\\_175/1163.html](http://www.vm.ee/estonia/kat_175/pea_175/1163.html) and [www.riso.ee/en](http://www.riso.ee/en).

<sup>8</sup> See <http://www.mkm.ee/index.php?id=8419>.

<sup>9</sup> See <http://www.ria.ee/27525>.

consistency and collaboration in developing the information society".<sup>10</sup> In November 2006 the Estonian government endorsed the "Estonian Information Society Strategy 2013",<sup>11</sup> which is a development plan presenting a general framework and basic objectives for the broad employment of ICT in the development of a knowledge-based economy and society. The objectives of the Estonian information policy for the upcoming years are the introduction of e-services in all state agencies and training and knowledge-raising activities for the whole society. Next to strengthening the efficiency of the Estonian economy and society, the policy aims to adopt national actions with EU priorities (particularly the objectives set out in EU i2010 and eGovernment action plans)<sup>12</sup>.

Additionally, an information technology action plan is annually approved by the government to set out information policy priorities and aims. The Ministry of Economic Affairs and Communications<sup>13</sup> is responsible for the co-ordination of the action plan, which summarises the activities that state agencies put in place for the development and strengthening of the information society. Various projects aim at developing and integrating ICT infrastructures of state and local governments into a citizen-friendly service. Some key projects in this regard are the eCitizen portal, the eGovernment portal, the eSchool project and the electronic X-Road environment project.<sup>14</sup>

Regarding the introduction of e-voting, the Estonian authorities argue that – next to the goals of increasing general election participation and engendering a higher

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<sup>10</sup> "Estonian IT Policy: Towards a More Service-Centred and Citizen-Friendly State. Principles of the Estonian Information Policy 2004–2006". Estonian Ministry of Economic Affairs and Communications, published on 6 May 2004. See <http://www.riso.ee/en/files/Policy.pdf>.

<sup>11</sup> See [http://www.riso.ee/en/files/IYA\\_ENGLISH\\_v1.pdf](http://www.riso.ee/en/files/IYA_ENGLISH_v1.pdf).

<sup>12</sup> "i2010 – A European Information Strategy for Growth and Employment". See [http://ec.europa.eu/information\\_society/eeurope/i2010/index\\_en.htm](http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm).

<sup>13</sup> See <http://www.mkm.ee/index.php?keel=en>.

<sup>14</sup> For further facts on these projects and other relevant figures and information on the Estonian information society see <http://www.ria.ee/27309>, <http://www.esis.ee/ist2004/base.html>, <http://www.riso.ee/eng> and [http://www.vm.ee/estonia/kat\\_175/pea\\_175/1163.html](http://www.vm.ee/estonia/kat_175/pea_175/1163.html).

turnout amongst younger people – voting via the Internet is an essential convenience in a progressive information society.<sup>15</sup>

## **2.2 E-voting in the parliamentary elections in March 2007: The Context**

On Sunday, 4 March 2007, Estonia held its national parliamentary elections. After several years of groundwork as well as various political and legal debates and developments, Estonian citizens equipped with an electronic ID-card were able to cast their vote via the Internet. Internet voting in the elections took place from 26 – 28 February (six to four days prior to Election Day) and overall 30.275 voters used this innovative voting channel. This number corresponds to 5.4 percent of the participating voters, while the overall turnout at these elections was 61 percent.

The overall turnout of the elections was 61 percent (58 percent in the parliamentary elections of 2003). Regarding the voting results, the Estonian Reform Party (Eesti Reformierakond), the Centre Party (Eesti Keskerakond) and the Union of Pro Patria and Res Publica (Isamaa ja Res Publica Liit) were elected with respectively 31, 29 and 19 seats as the strongest parties in the Riigikogu (consisting of 101 seats). The new government coalition was formed between the Estonian Reform Party, the Union of Pro Patria and Res Publica and the Estonian Social Democratic Party (Eesti Sotsiaaldemokraatlik Erakond). The government is lead by Prime Minister Andrus Ansip and assumed office on 5 April 2007.

### **- Development of e-voting and legal Issues**

For several years, the introduction of e-voting has been actively prepared and debated in Estonia and a crucial law from 2002 (the so-called “Local Government Councils Election Act”) provided the necessary measures and preconditions for preparing and implementing e-voting.<sup>16</sup> Following a successful pilot in a local consultation in January 2005,<sup>17</sup> the proposal for eventually applying e-voting in the

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<sup>15</sup> “E-voting in Estonia”. Report by Ülle Madise, Constitutional Committee of *Riigikogu* (Estonian Parliament). See <http://www.vvk.ee/engindex.html>.

<sup>16</sup> See [http://web.riigikogu.ee/ems/stenograms/2002/03/t02032709-07.html#P385\\_68538](http://web.riigikogu.ee/ems/stenograms/2002/03/t02032709-07.html#P385_68538).

<sup>17</sup> This e-voting pilot was conducted in Tallinn from 24 to 30 January 2005. It concerned the local consultation on the placing of a monument. About 14 percent of voters cast their votes online and the

country-wide local elections in October 2005 gained crucial momentum. The Estonian parliament passed – after several legal and political debates and controversies – the necessary “Local Government Council Election Act Amendment Act” on 28 June 2005.<sup>18</sup> Even though, however, the majority of the *Riigikogu* was in favour of introducing e-voting, there remained significant political opposition against this project. Above all, the then Estonian President Arnold Rüütel rejected the plan and opposed certain aspects of the proposed law. In particular, he criticised the inequality between e-voters and traditional voters in the sense that e-voters could make use of reversible voting (meaning that they could re-cast their e-votes) whereas this was not possible for traditional voters. Also, e-voters, in the first version of the legal text, had the possibility to annul their electronically-cast vote and could vote again on the Election Day at the ballot box. Eventually, the Parliament eliminated this possibility, while the option of reversible e-voting was maintained. President Rüütel, however, still opposed this set-up and not until the Constitutional Court decided on 1 September<sup>19</sup> that the proposed system did not violate the Constitution and electoral principles, the President ultimately signed the amendment on 5 September 2005<sup>20</sup> and the Act finally entered into force on 18 September 2005.

Apart from legal issues and related considerations, the Estonian National Electoral Committee stressed prior to the local elections in 2005 that there were no more technical obstacles to the use of e-voting.<sup>21</sup> Significant changes and adaptations in order to increase the security of e-voting were implemented after IT-specialists tested

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authorities judged that the objectives of the trial were fully met. See [http://www.vvk.ee/english/pilot\\_jan05.html](http://www.vvk.ee/english/pilot_jan05.html) and [http://www.vvk.ee/english/tulemus\\_eng.pdf](http://www.vvk.ee/english/tulemus_eng.pdf).

<sup>18</sup> See <http://www.riigikogu.ee/?id=35028>.

<sup>19</sup> Judgement of the Constitutional Review Chamber of the Supreme Court on the Petition of the President of the Republic to Declare the Local Government Council Election Act Amendment Act, passed by the Riigikogu on 28 June 2005, unconstitutional. See <http://www.riigikohus.ee/?id=11&tekst=RK/3-4-1-13-05> (sentence only available in Estonian).

<sup>20</sup> Resolution No. 888 of 5 September 2005 of the President of the Republic on the proclamation of the Act (<http://www.president.ee/et/ametitegevus/otsused.php?gid=64640>). The legal basis for e-voting in the local elections 2005 is finally laid out in the following legal acts: Local Government Council Election Act, § 50; Riigikogu Election Act, § 44; European Parliament Election Act, § 43; Referendum Act, § 37.

<sup>21</sup> See <http://www.vvk.ee/engindex.html> and <http://www.vvk.ee/elektr/docs/Yldkirjeldus-eng.pdf>. The latter document provides a detailed overview of the technical and organisational features of the applied e-voting system.

the system for vulnerabilities in various trial runs.<sup>22</sup> These preconditions allowed for the first-ever countrywide remote Internet voting with binding results at the local government elections of 16 October 2005, in which 9317 citizens cast their ballot via the Internet (this corresponded to roughly 2 percent of all actual voters and to approximately 1 percent of all persons entitled to vote).

The already-mentioned report for the Council of Europe, which analysed these elections, provided some deep insights into the local elections of 2005, the effects of the introduction of e-voting and the voting behaviour of the electorate.<sup>23</sup> Overall, the local elections were considered a big success and the smooth execution of the elections lent succour to the proponents of Internet voting and encouraged the further development and application of this new voting channel. After the elections, no complaints were filed to the Estonian National Electoral Committee or other legal instances. Furthermore, no problems with the functioning of the technical system occurred and the involved IT auditors gave a positive evaluation of the elections. The local elections were a litmus test and the largest challenge for the further implementation of e-voting in Estonia. In sum: as the elections passed off without any problems, they paved the way to using e-voting during the legislative elections of 2007, which are the object of analysis for this report.

#### - Technical issues and proceeding

An important factor concerning the introduction of e-voting was the general fact that a favourable technological infrastructure was present in Estonia, which supported the possibility of voting by Internet. Amongst other things (see below), a crucial precondition was in particular the wide dissemination of electronic ID-cards,<sup>24</sup> which are equipped with a computer-readable microchip. These ID-cards are a key factor in

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<sup>22</sup> The main results of these tests were the disconnection of several subsystems, police protection of the servers and the disconnection of the computer that processes the votes from the internet.

<sup>23</sup> The report put forward three explanatory models for the choice of e-voting in the 2005 elections and some specific recommendations regarding the concrete e-voting project in Estonia as well as some general recommendations towards reaching levels of best practice for the application of voting via the internet. For further information on the local elections in 2005 see as well the report "Internet Voting at the Elections of Local Government Councils on October 2005" by Ülle Madise, Preet Vinkel and Epp Maaten (<http://www.vvk.ee/english/report2006.pdf>).

<sup>24</sup> Already 1.000.000 Estonian voters (roughly 90 percent of the electorate) possess such electronic ID-cards. For further information on the Estonian ID-card see <http://www.id.ee/?lang=en>.

terms of e-voting and since 2002 it is compulsory to hold such an electronic ID card in Estonia.<sup>25</sup> To vote online, the voters access the online ballot with these ID-cards, which allow electronic personal authentication and digital signatures. The voters have to access a particular website and to introduce their electronic ID-card in a card reader, which is connected to the computer. Once identified through the ID-card and authenticated with a PIN code, a list of relevant candidates for the voter's constituency is displayed according to the voter's identification number. Subsequently, the voter makes his or her voting decision (which is encrypted via the so-called inner envelope) and confirms his/her choice with a digital signature (the so-called outer envelope). Finally, the voter gets a confirmation that the vote is recorded. The encrypted system is based on the so-called digital envelope method and uses public key cryptography, which ensures the maintenance of e-voters' privacy.<sup>26</sup>

Another favourable precondition for the smooth application of e-voting is the electronic data transmission and processing put in place at earlier elections and the fact that the registration of electors has been electronic in Estonia for several years.<sup>27</sup>

### - E-voting principles

The application of e-voting in Estonia is based on some leading rules and principles that seek to guarantee that all major principles of paper-voting are followed. First of all, the technical provisions of the e-voting mechanism follow the principle of secrecy, which consists of the two sub-principles of anonymity and voting in privacy to guarantee the freedom of the voter's choice.

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<sup>25</sup> Identity Documents Act § 39. See <http://www.legaltext.ee/text/en/X30039K10.htm>.

<sup>26</sup> The envelope method is similar to voting with envelopes at traditional elections. "The e-voter creates an inner envelope (which is essentially an encrypted vote) and an outer envelope (which is essentially a digital signature)." "Public key cryptography uses a key pair – private key and public key. When a source text is encrypted with a private key the resulting cryptogram can only be decrypted with the corresponding public key. And vice versa – once the source text is encrypted with a public key then the resulting cryptogram can only be decrypted with the corresponding private key." See for further details and technical explanations the National Electoral Committee (<http://www.vvk.ee/elektr/docs/Yldkirjeldus-eng.pdf>), the report by Madise/Vinken/Maaten, the presentation by Martens and the presentation "Legal basis of Estonian internet voting by Ülle Madise (<http://www.vvk.ee/engindex.html>). A very detailed guideline for the e-voting process can be found at [http://www.valimised.ee/windows\\_eng.html](http://www.valimised.ee/windows_eng.html).

<sup>27</sup> For further information see the report by Madise/Vinkel/Maaten.

Secondly, the principle of anonymity is of central importance. This principle is guaranteed by the already described mechanism of creating an “inner and outer envelope” when casting the electronic vote: the vote is encrypted via the “inner envelope” and bent to the personal data via digital signature as the “outer envelope”. The decryption of the vote is only possible after removing the “outer envelopes”.

Thirdly, the principle of privacy obviously poses some difficulties for this new voting channel via the Internet. The problem of “family voting” and similar possible influences on the individual voter’s decision represents a major criticism of the use of Internet voting. However, it has to be kept in mind that postal voting suffers theoretically from the same problem. To guarantee the voter’s expression of free will the right to change the e-vote is applied. After having cast a vote, the voter can change his/her mind an unrestricted number of times and only the last e-ballot is counted. Furthermore, the priority of the paper-ballot tackles the problem of “family-voting”: manual re-voting is allowed and if the vote is cast in paper during advance polling station voting days, the e-vote is revoked.

The principle of equality is not affected by this procedure as only one vote is counted per voter and the e-voter’s right to change the e-vote is justified by the need to guarantee the principle of privacy.

### **3. Goals of the study**

The foremost goal of this study is to academically monitor and analyse the political, demographic and socio-economic factors and effects linked to the use of Internet voting in the Estonian parliamentary elections in March 2007. Based on the conducted telephone survey and the obtained data, the study aims to answer the following questions:

- Who votes online? Who prefers the traditional channel of participation at the polling place? Do the socio-demographic and socio-economic profiles of Internet voters differ in any substantive way from those voting at the polling station and from those abstaining in the elections?
- How can we explain the choice of the voting channel?
- What is the impact of offering Internet voting on electoral participation?
- What are the political effects (if there are any) of electronic voting? Is the introduction of this channel of participation politically neutral with regard to the outcome of the elections or not?
- What role did ICTs play in the campaign preceding the 2007 national elections?
- How do these results compare with the analysis presented in the study of the October 2005 local elections in Estonia?

In answering these questions, the study is able to provide a thorough description and an in-depth analysis of the impact of e-voting on the elections and the related voting behaviour of the electorate. This allows us to generate some substantive conclusions and recommendations regarding both the specific application of e-voting in the Estonian case and more general aspects of the Internet as a new voting channel and its impact on elections. The fact that the findings of the study offer a powerful comparative perspective (because of the related and similar study of the local elections in 2005) strengthens the relevance of the results and conclusions of this research.

## **4. Methods**

In order to answer the above-mentioned questions, we conducted a classic telephone survey among the Estonian electorate. This specifically designed-survey contains the answers from 987 respondents who had the right to cast their ballot in the elections of March 2007. The sample consists of 367 e-voters, 365 “traditional” voters (voters who cast their vote at the polling place) and 246 non-voters (abstentionists)<sup>28</sup>. This data allows us to undertake a thorough analysis of the voting channels and voting behaviour of the Estonian electorate. The survey method used was CATI (“computer-assisted telephone interviews”) and the survey itself was outsourced to a renowned survey institute in Estonia, called *OY Uuringukeskus Faktum*.<sup>29</sup>

Given the fact that no more than 30275 e-voters participated in the elections, a major difficulty in conducting the survey was to reach a sufficient number of e-voters. In order to overcome this difficulty, the national electoral commission, on our request, provided us with 1000 names of e-voters, randomly chosen, who participated in the elections. The phone numbers of these voters were researched, giving us 500 actual contacts, and the voters’ details were later completely anonymised by the survey institute. Considering the rather low number of e-voters, it is very satisfying that we managed eventually to interview 367 e-voters. In other words: we could get a response rate of over 70 percent among the sample of e-voters.

The Estonian National Electoral Committee has given the research team – as already mentioned – access to its aggregate data in conformity with and within the limits of the data protection and electoral legal framework. Taken together, these data sources combine aggregate data (official statistics) with individual level data

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<sup>28</sup> Note that for 9 observations no information on voting behavior is available.

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(stemming from our survey) and allowed the research team to effectively answer the questions presented above.

The proponents of the study can build on a large experience with surveys in the field of e-voting. Central questions of the so-far developed questionnaires, particularly those of the e-voting pilots in the Swiss cantons of Geneva and Zurich, were used in their original wording or adapted to the Estonian context. The research team replicated the 2005 questionnaire for the survey, adding relevant questions above all concerning the campaign preceding the actual poll.

## **5 The Internet and the campaign in the March 2007 elections**

In 2007, our survey of a sample of the Estonian electorate also included a series of questions related to the parliamentary election campaign and where Estonian voters obtained their political information. A primary research question is whether the addition of the Internet voting channel in Estonia is altering how voters access information, and how political parties are reaching out to potential voters: is the availability of Internet voting changing the nature of political discourse in Estonia? The survey questions on the flow of political information focused on (1) the general way in which voters were exposed to the campaign; (2) whether individuals used the Internet to educate themselves about the issues, parties, and candidates in the election, (3) the most common ways that voters perceived the political parties used to communicate with them. For each of these three sets of questions, we examine first the difference in perceptions and experiences between voters and non-voters in the parliamentary elections. Second, we consider differences in perceptions and experiences among Election Day voters, polling station advance voters, and Internet voters. Our interest is in seeing if voters who cast ballots using different modes of voting also access campaign differently. For example, do Internet voters also use the Internet more to access information about the campaign? Also, using these data we can see the ways in which voters and non-voters differ in their search for campaign information. Finally, we can examine how voters and non-voters perceive the push of campaign information from parties and candidates and whether there are differences in perceptions across various groups.

We begin by examining the informational sources from which individuals obtained information regarding the campaign and elections. As would be expected, in general voters are more engaged in the campaign than are non-voters although sizable percentages of non-voters also were engaged in learning about the campaign. When we consider various campaigning tactics, we find that there are some campaign activities that affect both voters and non-voters similarly. Indiscriminate campaign

tactics, such as political ads in newspapers and magazines, flyers and leaflets, and street posters similarly penetrate across both groups. There are also very high levels of penetration across both groups for radio, television, and newspaper articles but voters were more likely to pay attention to these three forms of communication compared to non-voters. Voters are also more likely to discuss the election with co-workers or friends compared to non-voters.

When we examine campaign information sources for voters, based on the mode of voting that they used, we find that, for many of these items, there are marked differences among voters based on the mode of voting they choose. Specifically, Internet voters tend to be less affected by traditional modes of political communication. They are less likely to have obtained information from radio, flyers and leaflets, political ads in papers and magazines, posters in the streets, party tents and outdoor events, or direct mail. Internet voters are similar to other voters in their use of newspapers and television as sources of election information. The major difference between Internet voters and polling place voters is that Internet voters are more likely to obtain election information online and to talk about the election with co-workers and family members. There are also interesting differences between advance polling station voters and Election Day voters. Advance voters tend to be slightly more engaged than are Election Day voters in the process of obtaining information about the election.

*Table 1: Campaign information sources: Averages by mode of participation*

<i>Could You Tell For Each Information Source Whether You Have Obtained Information On The Issues At Stake In The Elections From These Sources During The Campaign Preceding The Elections?</i>	<i>Did You Vote In The 2007 National Elections In Estonia?</i>		<i>How Did You Vote In These Elections?</i>		
	Yes	No	Voted On Election Day	Voted In Advance Polling Station	Voted By Internet
Editorial Contributions To Newspapers And Magazines	<b>79.56</b>	<b>70.37</b>	80.38	83.84	77.66
Radio Broadcasts Concerning The Elections	<b>75.20</b>	<b>63.37</b>	<b>79.25</b>	<b>83.84</b>	<b>70.03</b>
TV Broadcasts Concerning The Elections	<b>93.46</b>	<b>82.72</b>	93.96	93.94	93.19
Leaflets, Flyers	57.63	54.73	<b>70.94</b>	<b>70.71</b>	<b>44.41</b>
Political Ads In Newspapers And Magazines	44.28	39.92	<b>54.72</b>	<b>57.58</b>	<b>33.51</b>
Posters In The Streets	36.78	36.21	<b>42.26</b>	<b>47.47</b>	<b>30.25</b>
Opinion Polls	<b>43.60</b>	<b>32.92</b>	38.87	49.49	45.78
Party's Election Tents, Stalls In The Streets And Parks	8.04	6.17	<b>12.83</b>	<b>14.14</b>	<b>3.00</b>
Direct-Mailing Materials	<b>45.10</b>	<b>37.86</b>	<b>52.83</b>	<b>58.59</b>	<b>36.24</b>
Discussions At Your Workplace/Educational Institution	<b>33.51</b>	<b>23.87</b>	<b>24.15</b>	<b>23.23</b>	<b>42.78</b>
Discussions Among Your Family, Friends	<b>62.94</b>	<b>44.03</b>	<b>51.70</b>	<b>64.65</b>	<b>70.84</b>
Communications On The Internet	<b>13.76</b>	<b>6.58</b>	<b>8.30</b>	<b>5.05</b>	<b>20.16</b>
Sms/Text Messages	<b>4.77</b>	<b>1.65</b>	4.15	3.03	5.45
Email	<b>5.18</b>	<b>1.65</b>	4.53	5.05	5.45
<b>Somewhere Else (Partisan Happening, Public Debates, Etc)</b>	<b>7.22</b>	<b>2.06</b>	9.43	8.08	5.18

Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < .05$ .

Next, we consider differences in the use of the Internet as a mode of education for citizens in Estonia. Not surprisingly, voters are more likely than non-voters to use the Internet to learn more about the campaign, although 30 percent of non-voters also read about the campaign online. In almost every case, voters used the Internet more than non-voters for campaign purposes. When we examine voters more carefully, we find that Internet voters are much greater consumers of online information compared to both Election Day voters and advance polling station voters. Internet voters were 20 percentage points more likely to have read about the elections online and to have used the Internet to inform themselves about politics compared to traditional Election Day voters. Online information about candidates and political parties was used by almost 30 percent of voters and 37 percent of Internet voters in their search for election information and almost 24 percent of voters and 30 percent of Internet voters used the Internet explicitly to find information about whom to vote. Internet voters bring their ICT skills to all aspects of the electoral process, not just the process of voting. We also see small but important differences between advance polling station voters and Election Day voters, with advance voters also more likely to use the Internet to learn about politics and the elections.

When we examine new modes that political parties can use to communicate with potential voters—such as blogs, emails, videos, or online commentaries—we find that there are few differences among voters and non-voters or among voters voting online or in a polling station. Voters and non-voters alike watched campaign video clips online, which suggests that this is a medium that can penetrate to the non-voting population even if it may not have motivated them to cast a ballot. Voters, especially Internet voters, were slightly more likely to watch these online videos compared to non-voters. Only a small number of voters signed up for emails or posted information about the election online. In Table 2, it is important to note that there are several questions, such as whether individuals signed up to receive emails from the candidates or political parties, which have very low response rates. In such cases, it is difficult to make any generalisations across voting mode for these questions.

*Table 2: Internet as a mode of education: Averages by mode of participation*

	<i>(In Percent for those Answering "Yes")</i>				
	Did you vote in the 2007 national elections in Estonia?		How did you vote in these elections?		
	Yes	No	Voted On Election Day	Voted In Advance Polling Station	Voted By Internet
<b>In the months leading up to the Parliamentary elections, did you hear or read anything online about the parliamentary elections?</b>	<b>55.41</b>	<b>30.43</b>	<b>40.52</b>	<b>50.94</b>	<b>62.91</b>
<b>Do You use the Internet in order to inform yourself about politics?</b>	<b>41.65</b>	<b>21.12</b>	<b>27.45</b>	<b>32.08</b>	<b>49.55</b>
Volunteer online to work for a campaign	2.57	0.62	2.61	3.77	2.37
<b>Look for more information online about political party or candidates' positions on the issues or voting records</b>	<b>28.10</b>	<b>13.04</b>	<b>13.73</b>	<b>12.00</b>	<b>37.20</b>
<b>Look online for whom to vote</b>	<b>23.60</b>	<b>11.80</b>	<b>11.56</b>	<b>18.37</b>	<b>29.76</b>
<b>Participate in online endorsements or ratings polls</b>	<b>20.79</b>	<b>6.83</b>	<b>9.52</b>	<b>18.37</b>	<b>26.19</b>
<b>Use the Internet to check the accuracy of claims made by or about the political party or candidates</b>	<b>14.04</b>	<b>5.59</b>	<b>7.48</b>	<b>12.24</b>	<b>16.96</b>
Watch video clips about the political party or candidates or the election that are available online	11.24	9.32	9.52	10.20	11.90
Sign up to receive email from political party or candidates or campaigns	1.50	1.86	1.36	2.04	1.49
Post your own political commentary or writing to an online news group, website or blog	3.93	2.48	4.08	6.12	3.57
Forward or post someone else's political commentary or writing	0.94	0.00	0.68	2.04	0.89
Create and post your own political audio or video recordings	0.56	1.86	1.36	2.04	0.00
Forward or post someone else's political audio or video recordings	0.94	0.00	2.04	4.08	0.00

Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < .05$ .

We next consider how political parties and candidates used various modes of campaigning to push information to citizens, as perceived by the citizenry. Not surprisingly, we see that parties and candidates were more likely to have their messages received by likely voters as compared to non-voters. Only the most indiscriminant form of campaigning—door to door canvassing—was not perceived as more pervasive by voters compared to non-voters. When we consider just voters, we see variations in the types of contacts they perceived receiving. For example, advance voters reported more contacts by mail from a party or candidate compared to others. Likewise, Internet voters were twice as likely as others to receive an email contact from a candidate or party. Internet voters were also more likely to be contacted via telephone.

*Table 3: Information from political parties and candidates: Averages by mode of participation*

	<i>Did You Vote In The 2007 National Elections In Estonia?</i>		<i>How Did You Vote In These Elections?</i>		
	Yes	No	Voted On Election Day	Voted In Advance Polling Station	Voted By Internet
In The Past Two Months Have You....?					
Received Mail Urging You To Vote For A Particular Political Party Or Candidate	<b>59.26</b>	<b>43.62</b>	56.98	66.67	59.13
Received Email Urging You To Vote For A Particular Political Party Or Candidate	<b>11.04</b>	<b>4.12</b>	<b>7.55</b>	<b>6.06</b>	<b>14.71</b>
Been Visited At Home By Someone Urging You To Vote For A Particular Political Party Or Candidate	3.95	3.70	5.28	3.03	3.27
Received Prerecorded Telephone Calls Urging You To Vote For A Particular Political Party Or Candidate	<b>6.40</b>	<b>2.88</b>	5.66	4.04	7.63

Note: bold-faced entries are instances where a chi-square test for the observed row frequency comparisons are statistically significant,  $p < .05$ .

When we examine which parties the voters remembered contacting them, we see that the three top vote-getting parties were also the parties that voters remember having contacted them. Internet voters in general recalled more contacts than did others.

*Table 4: Contacted by political parties: Averages by mode of participation*

	<i>TOTAL</i>	<i>Voted On The Election Day</i>	<i>Voted In An Advance Polls At Polling Station</i>	<i>Voted In An Advance Polls By Internet</i>
Center Party	32.05	13.46	3.21	15.38
IRL	20.19	7.37	3.53	9.29
Reform Party	20.19	8.33	3.85	8.01
Many Different Parties	11.22	5.13	1.28	4.81
People's Union	6.41	2.56	0.96	2.88
Social Democrats	5.13	2.24	0.64	2.24
Other	2.88	1.28	0.32	1.28
Green Party	1.92	0.96	0.00	0.96

In addition to these survey data, we also contacted all of the political parties and were granted post-election interviews with representatives from three of them: (1) IRL, (2) Reform, and (3) the Social Democrats. Each of the parties discussed how they had expanded their online presence dramatically over the past two years to target voters, especially young voters. These parties typically had dynamic websites that included information about the party platform, policy statements, press releases, information about the candidates, and campaign materials. This allowed any interested voter to quickly and easily learn about the party platforms and issues by surfing the Internet.

Clearly, our interviews revealed that the parties used the Internet as a tool for reaching out to voters. The parties worked to create email lists and to contact party members using email regarding events and other party activities. These parties also purchased email lists in order to conduct small email campaigns that targeted all voters, but the parties were also sensitive to the need not to overwhelm voters with information and contacts. The use of online video was common, with parties creating

short videos on YouTube or putting campaign videos on their websites. Central party candidates also had blogs during the campaign that provided online content that was more personal. Parties also used the web to provide voters with information about their candidates in order to facilitate information seeking by voters. In addition to using the Internet for campaigning, some parties explicitly attempted to email or SMS message voters to get them to vote early. These tactics are similar to those used in the United States and reflect the open nature of the Internet and the desire by parties to present an open face to the voting public. These tactics are likely to expand and become more developed in the next election cycle.

## 6 Participation in the national elections of March 2007

### 6.1 Where and when e-voters participated

To begin with the analysis of the survey results, and in analogy to the 2005 study, we reduced the data concerning the geographical distribution of our respondents according to the type of settlement they live in. Their place of residence has been coded as either urban or rural, allowing us to measure whether or not the introduction of e-voting indeed creates – as it is often hypothesised in the literature – a cleavage between cosmopolitan, urbanized voters using this “hype” form of participation and their less modern, rural counterparts, who prefer to rely on traditional voting methods.

The results of this bi-variate analysis support the findings of 2005: again, there is no significant difference in the general participation pattern and the use of e-voting based on the origin of the respondents. In other words, there is no major difference or bias between town and country (*Table 5*).

*Table 5: Frequency of usual political participation and mode of vote in 2007*

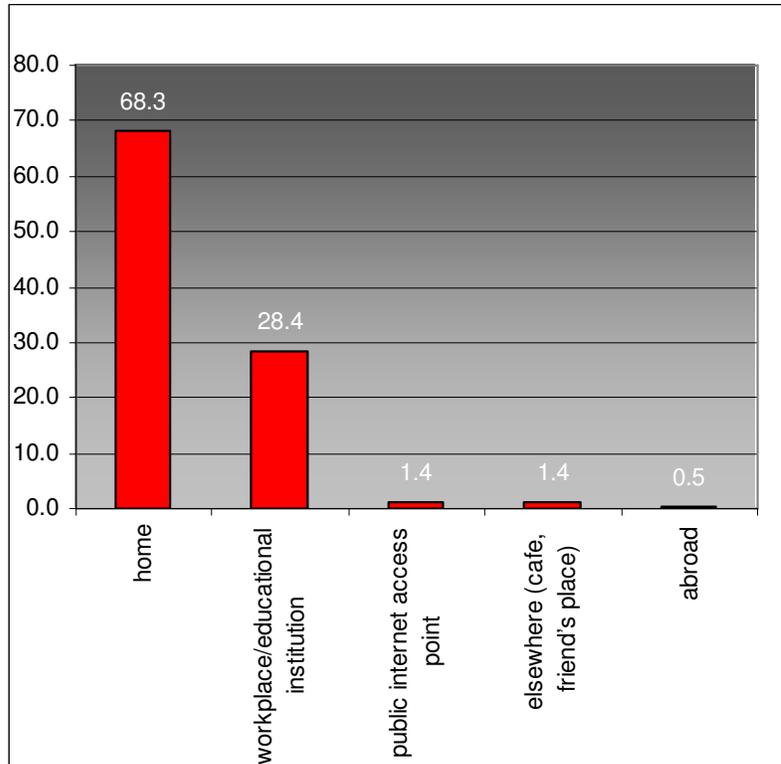
Type of settlement	Type of political participation (in percent)			
	no vote	Vote at polling place	e-vote	total
Urban	72.0	66.8	69.8	69.2
Rural	28.0	33.2	30.2	30.8
Total	100	100	100	100
N	(243)	(364)	(367)	(974)

N=982, valid cases=974, missing cases=8.

Regarding the locus of Internet voting, *Figure 1* shows that a large majority of e-voters cast their e-ballot from home (68.3 percent) or at their workplace (28.4 percent). Only a very limited number of e-voters (2.8 percent) logged onto the system in order to vote from another place, i.e. a café, a friend’s place, or a public Internet access point. Here, we find slight differences with the 2005 study: voting from home has become more prominent (it was 54.4 percent in 2005), indicating a significant

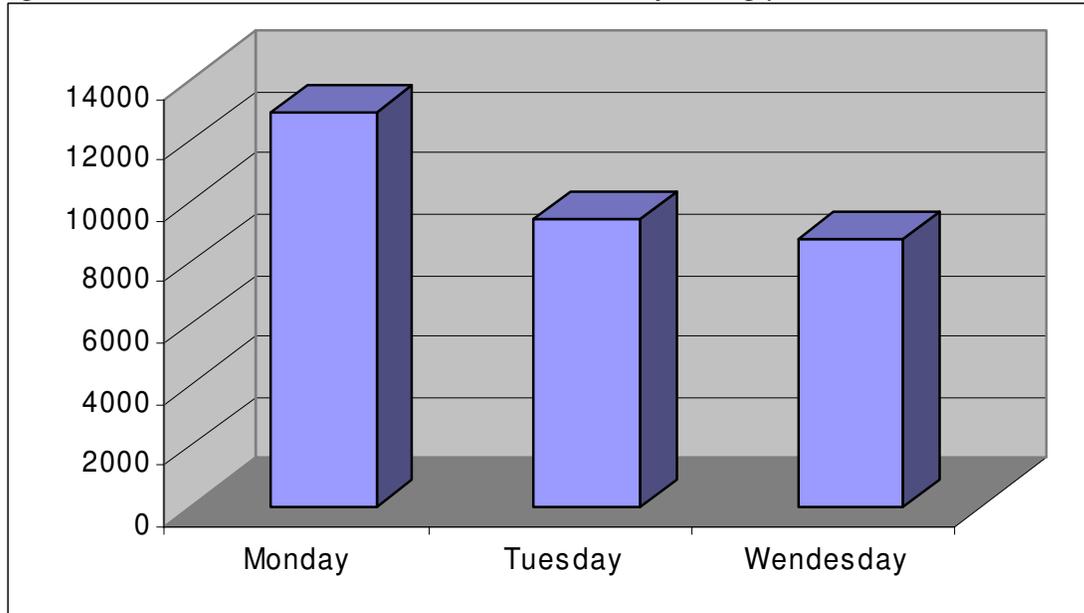
move towards an ever more private form of voting behaviour. Finally, only 0.5 percent of e-voters declared having voted from abroad. This is not surprising given the fact that the survey took place on Estonian territory and did not comprise Estonian citizens living abroad.

*Figure 1: Where e-voters cast their ballots in the 2007 elections*



With regard to the timing of e-voting, we dispose of aggregate data that is based on the entire universe of e-voters. It allows us to measure two distinct things: first, it shows that the opening day of the e-voting period attracted most voters. (*Figure 2*). On day two and three the distribution of e-voters was quasi identical. This distribution was slightly different in 2005, where “first day e-voting” was less frequent.

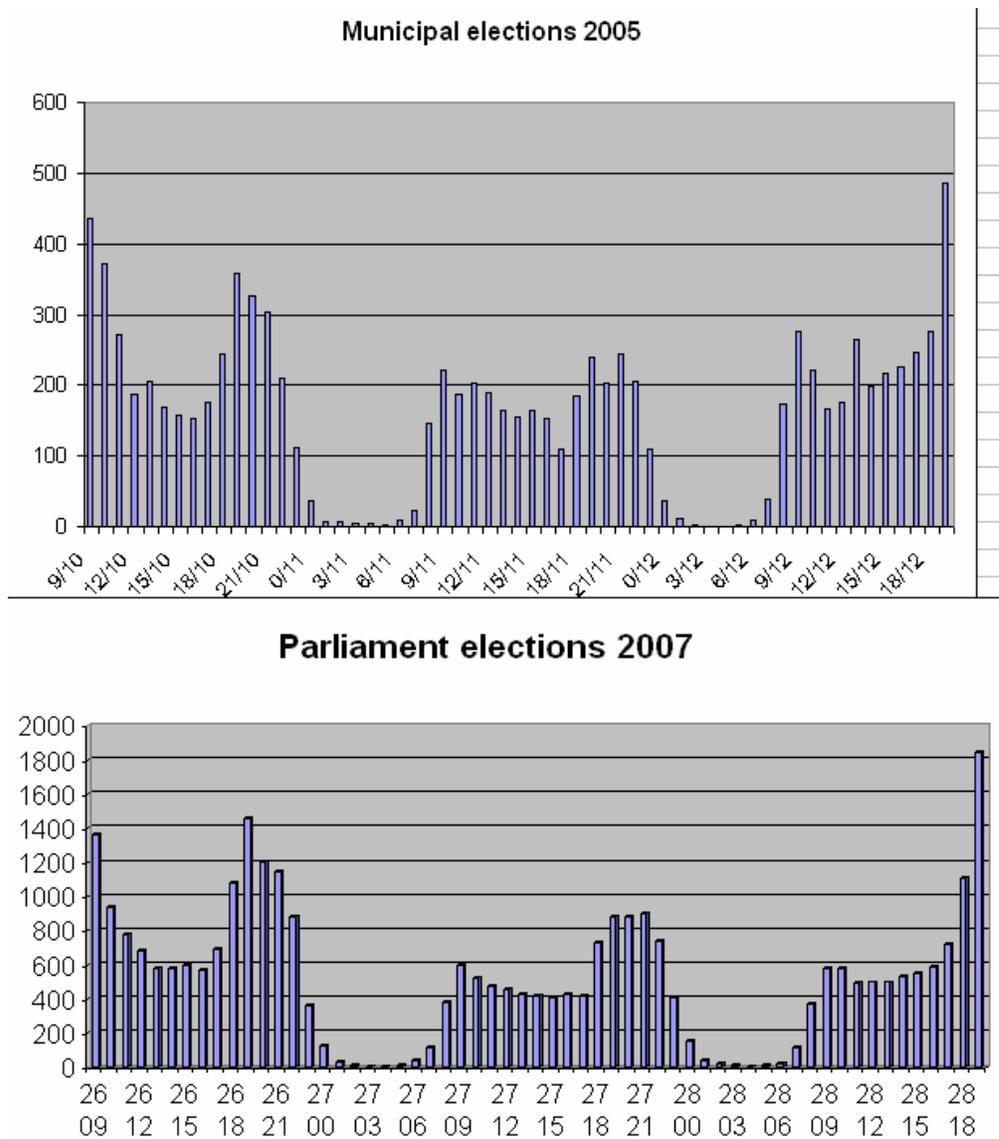
*Figure 2: Distribution of e-voters over the three day voting period*



Source: <http://www.vvk.ee/english/tarvi0303.ppt>

Differences in the frequency of voting over the Internet can also be measured across the hours of the day. As *Figure 3* shows, there are two peaks of e-voting during the day. The first one is in the morning between 9am and 10am, the second one between 6pm and 8pm. Based on these findings, one can assume that the majority of e-voters voted at the beginning of their working day and when getting home from work. The distribution between the other hours of the day is almost identical, with an almost total absence of e-voting activity between midnight and 8am. Finally, *Figure 3* also shows that there were almost no differences to be recorded between the October 2005 local elections and the March 2007 national elections with regard to these hourly patterns.

Figure 3: Distribution of e-votes over 24 hours in 2005 and 2007



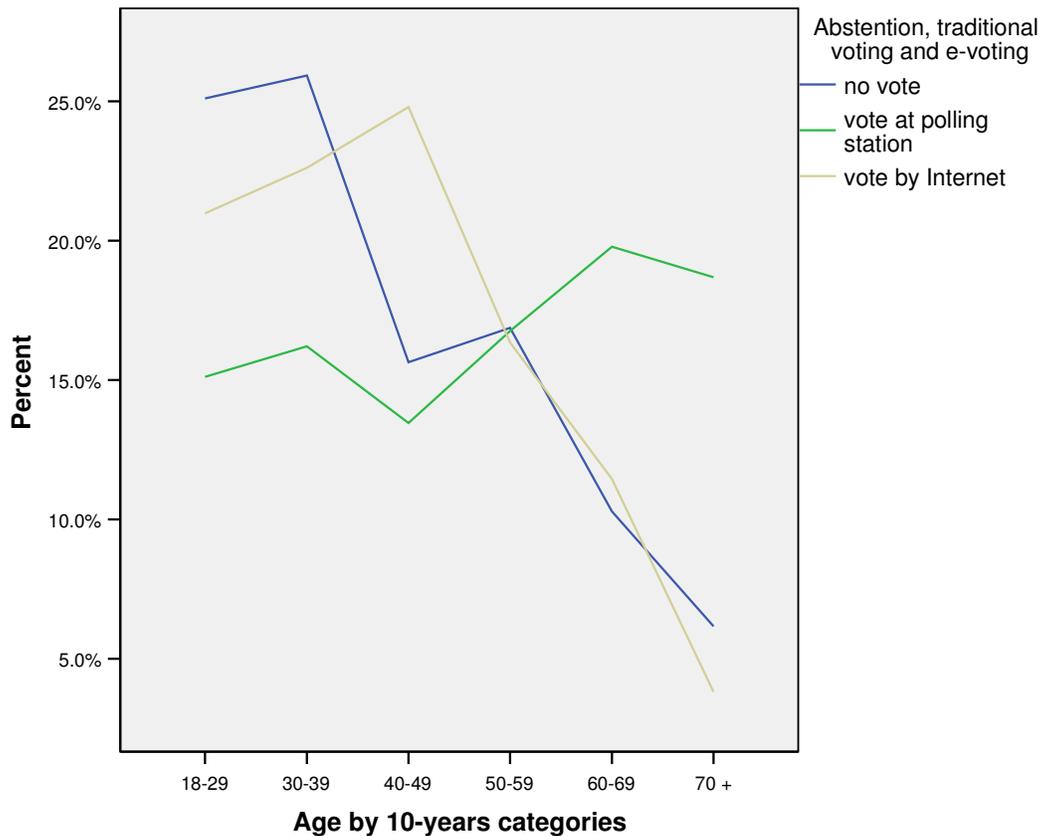
Source: <http://www.vvk.ee/english/tarvi0303.ppt>

## 6.2 Participation in elections by age and gender

As in 2005, our results regarding the impact of age and gender on the choice of voting channels in the context of e-voting is of obvious interest. These results are displayed in *Figure 4* and *Table 6*. In both cases, our survey shows very interesting results.

Considering voting behaviour by age category, it becomes clear that above all younger people participated by voting over the Internet. *Figure 4* indicates how far the decision to vote at the polling station, to vote by Internet or not to vote at all is related to the age of the respondents. This figure is almost identical to the 2005 figure. Thus so is our interpretation of the results.

*Figure 4: Age and mode of participation*



The curves in *Figure 4* clearly reveal that e-voting shows the inverse trend across age compared with the trend of voting at the polling station. The latter almost linearly increases with age while the opposite is true with regard to Internet voting. Of central interest is the fact that the curve of non-voters is pretty similar to the curve of e-voters. Based on this finding, one can conclude that the introduction of voting by Internet seems to have a significant impact on the participation of younger voters in

elections. The use of Internet voting mobilises the generally underrepresented young persons, while it is more seldom used by older voters.

Before we start analysing the potential impact of e-voting on the frequency of electoral participation, we briefly go into the question of a hypothetical gender gap introduced by e-voting. Is the latter gender-neutral or does e-voting favour one gender category over the other? First, our bi-variate analysis (*Table 6*) reveals that female voters are overrepresented in the Estonian electorate: in our representative sample of non-voters and voters at the polling station, women represent 358 out of 607 polled respondents, corresponding to a rate of 59.0 percent. This is indeed similar to the aggregate age-structure of the Estonian electorate.

*Table 6: Gender and mode of participation*

Mode of participation	Gender		
	male	female	n
no vote	44.9%	55.1%	243
vote at the polling station	38.5%	61.5%	384
e-vote	48.8%	51.2%	367
Overall n	426	512	938

N=982, valid cases=974, missing cases=8.

However, the category of e-voters is split into more or less equal parts of male and female voters (48.8 percent male and 51.2 percent female voters). Given the fact that women are structurally more numerous within the Estonian electorate, this bi-variate finding means that male voters have been (slightly) disproportionately more mobilised by the possibility to vote over the Internet than was the case with their female counterparts. In our subsequent analyses we will come back to this point in more detail in order to confirm or infirm respectively this apparent relationship between gender and voting channels.

### **6.3 Potential impact of e-voting on the frequency of electoral participation**

In the following section, we focus on one of the most interesting aspects of the survey, the potential impact of e-voting on the frequency of electoral participation. Keeping in mind that one of the main reasons for introducing e-voting was to increase voter turnout, the following analysis is of major interest both from an academic and a policy-making perspective.

First, *Table 7* presents the frequency of the respondents' usual frequency of political participation in elections and compares the latter to their concrete mode of vote in the national elections of 2007.

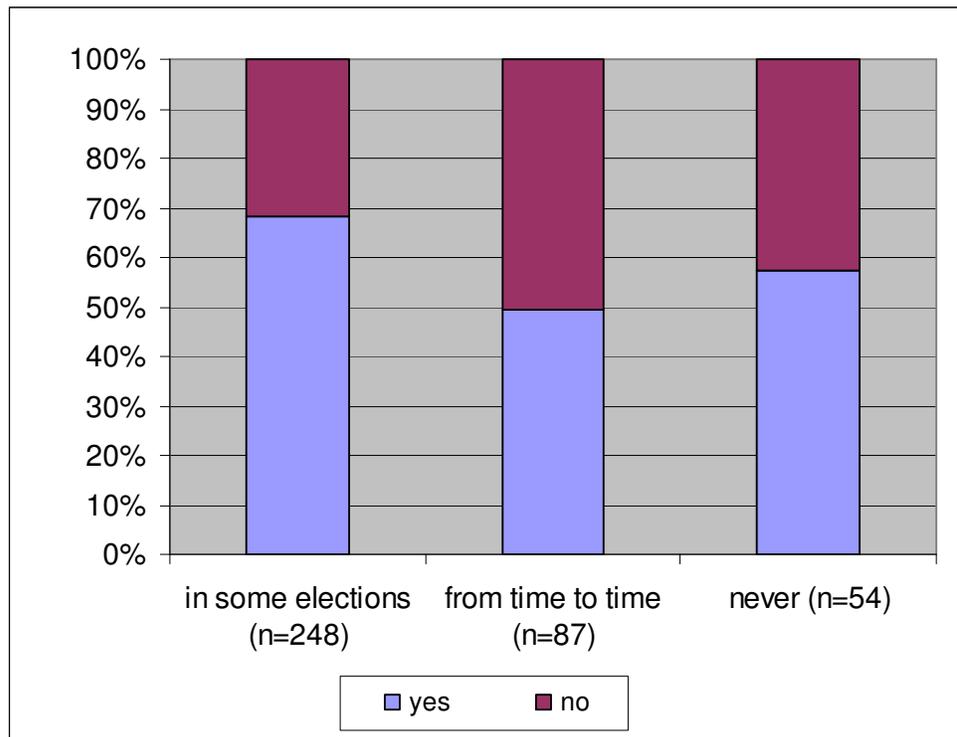
*Table 7: Frequency of usual electoral participation and mode of vote in 2007*

Vote in 2007...	Frequency of usual electoral participation					Total (% , n)
	in all elections	in some elections	from time to time	never		
at the polling place	78.8	20.1	0.8	0.3		100.0
by Internet	67.8	29.4	2.5	0.3		100.0
						100.0
Total (n)	532	180	12	2		726

*Table 7* reveals that there is a slight difference between the usual patterns of political participation of voters who voted “traditionally” or over the Internet in 2007. This is slightly different from 2005, where no such difference could be measured. In 2007, among the traditional voters the very faithful voters represent 78.8 percent as compared to “only” 67.8 percent among e-voters. Inversely, among e-voters, the categories of less frequent voters are larger than among traditional voters. Radical non-voters, however, are just as rare among traditional voters as among e-voters (0.3 percent respectively). In other words, e-voters are less disciplined in their electoral participation, a fact which could indicate a slight mobilization effect of e-voting.

We also asked the respondents to answer the question whether they believe that the introduction of e-voting could boost the frequency with which they participate in elections. *Figure 5* contains the answers to this question as a function of the respondents' usual pattern of political participation.

*Figure 5: Subjective estimation of future increase in participation if e-voting is introduced as a function of the frequency of the usual pattern of political participation (n=389)<sup>30</sup>*



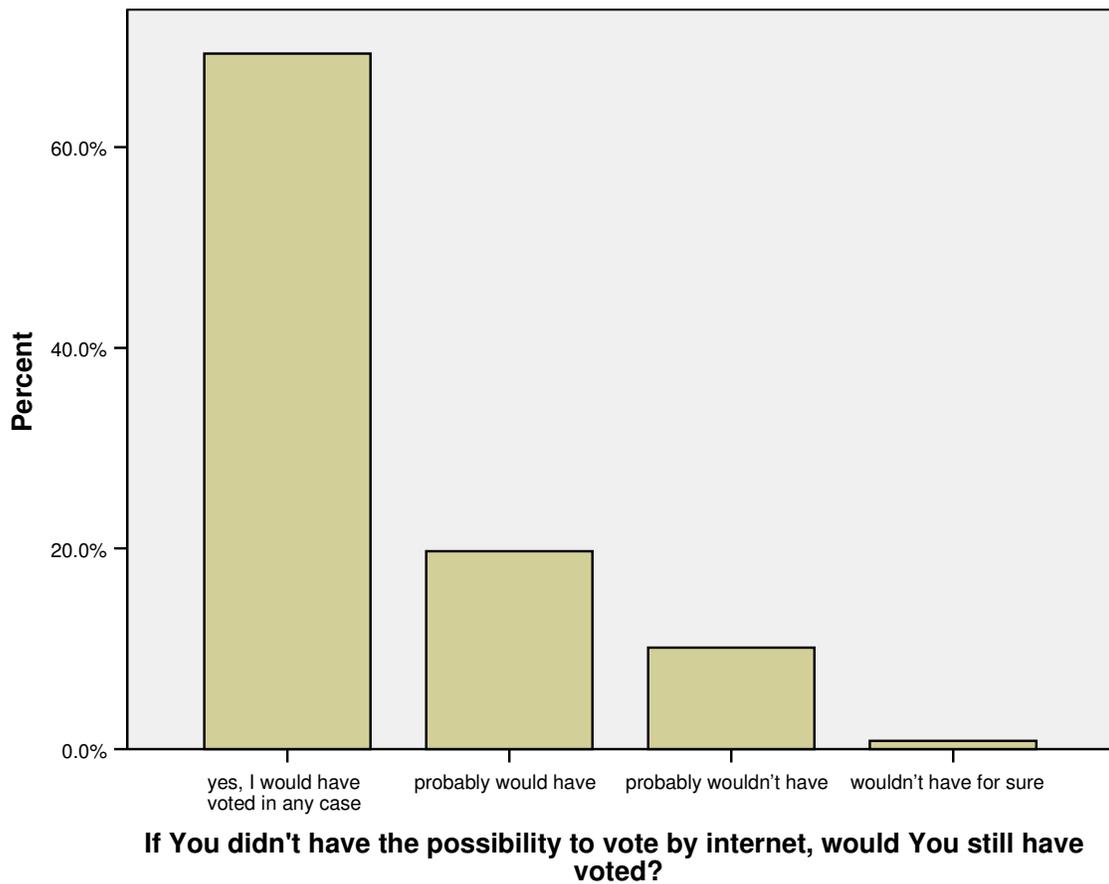
Analysing this figure, we see that e-voters who usually only vote in some elections are particularly positive when it comes to their subjective future voting behaviour. Among those participating only from time to time or who usually abstain, the expectations about a future increase in participation due to the availability of e-voting are slightly lower.

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<sup>30</sup> Note that respondents indicating that they voted in all elections were not asked about the potential of e-voting to increase their future voting frequency.

The last aspect in this part focuses on e-voters in the elections and provides very interesting findings as well. *Figure 6* displays the answers to the question whether the e-voters would have voted in the elections had they not had the possibility to vote by Internet.

*Figure 6: Subjective estimation of participation in the absence of e-voting*



The most striking finding in this regard is immediately apparent.. *Figure 6* reveals that two-thirds (69.3 percent) of the e-voters would have voted anyway, even if it had not been possible to cast their vote by Internet. Furthermore, another 19.7 percent would “probably” have voted were voting by Internet impossible. This means that overall 89 percent of the e-voters would have certainly or probably voted regardless of the possibility of e-voting. Only 0.8 percent of the e-voters would certainly not have voted

if the voting channel by Internet would not have been offered; 10.1 percent of the e-voters “probably would not have” voted in this case. In other words, only roughly one out of ten e-voters would (probably) not have cast their vote, if the traditional voting channels had been offered exclusively. This proportion has, however, gone down by half in comparison with 2005, a fact which can most probably be explained by the overall higher numbers of e-voters.

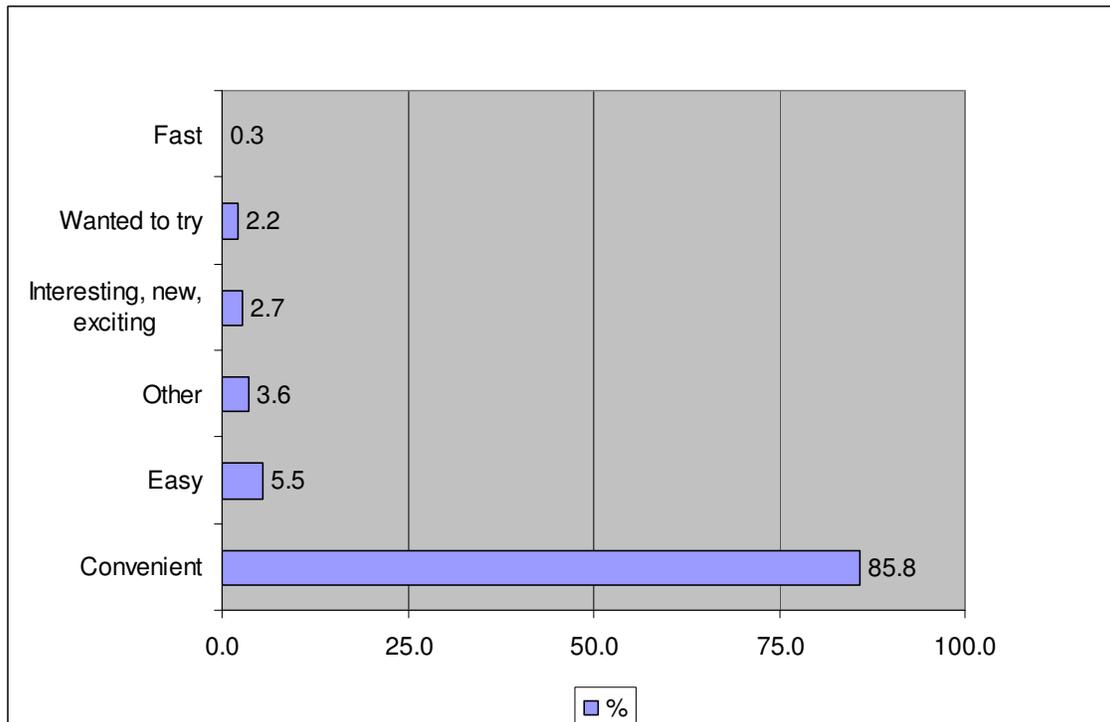
These findings are obviously of utmost importance with regard to the question of whether the introduction of e-voting contains the potential to increase the overall voter turnout in elections. While it is in our case certainly interesting that roughly one tenth of the e-voters would certainly or probably not have voted without having had the possibility to vote by Internet, the impact of this finding on the overall turnout is rather irrelevant. Given the fact that the e-voters made up only 5.4 percent of the participating voters (and only about 3.4 percent of the eligible voters), this one tenth of e-voters has no significant impact on the overall turnout. Roughly calculated, the turnout would only have been 0.5 percent lower with e-voting. Should e-voting become more popular, however, and should this one-tenth of otherwise abstaining citizens turn out simply because e-voting was offered, the impact on turnout could become quite tangible. But this question will have to be addressed in the future.

#### **6.4 Subjective reasons for the choice of e-voting and future prospects**

Before we go into more structural relationships explaining the choice of e-voting at the Estonian polls (part 7) we briefly present our data on the subjective reasons e-voters and traditional voters indicated for their respective choice of voting mechanisms.

First, we asked all 366 e-voters in our sample to spontaneously name the main reasons why they chose to vote over the Internet. These responses were coded by the interviewers into six categories (*Figure 7*).

Figure 7: Subjective reasons for choosing e-voting in 2007



Note: N=366. Valid cases=366, missing cases=0.

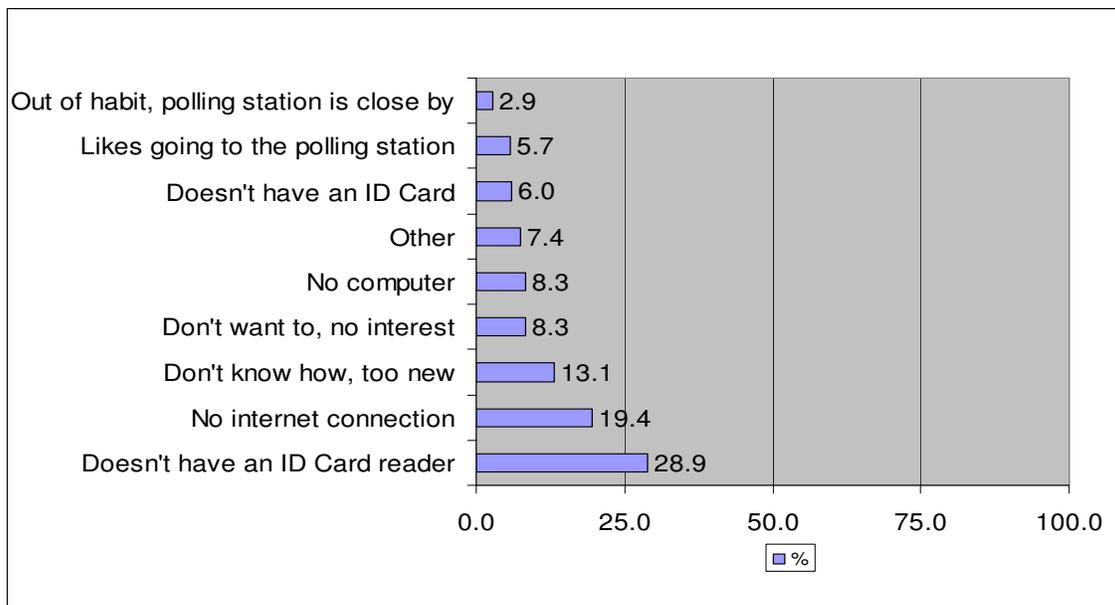
Figure 7 clearly reveals that e-voting was above all perceived as a device that was convenient in that it made voting more speedy, practical and overall simplified participation. 85.8 percent of e-voters mentioned this reason as having guided their choice for voting over the Internet. Compared to the 2005 “*première*” of e-voting, in which almost one fifth of the e-voters indicated that the “kick of the first time” was the primary motivation for their e-vote, this proportion came down to less than 5 percent (“wanted to try” and “interesting, new, exciting”) in 2007. In other words, this “first time curiosity” which we could show in 2005 was significantly reduced, as the “curious voters” might have become faithful to e-voting because the first experience in October 2005 was convincing to them.

We can test this latter hypothesis with our survey. We specifically asked all our respondents if they voted in 2005 and if they did so, by which channel. In our sample we have 58 valid cases of reported e-voters in 2005. Of these 58 individuals, 58

voted over the Internet in 2007. In other words: the “faithfulness ratio” is 100 percent: none of the e-voters of 2005 still participating in 2007 did so otherwise than over the Internet. This is quite a strong finding. For participation-willing electors, having tested the Internet voting mechanism the first time, no movement back to traditional forms of participation could be measured.

In a next step we asked all traditional voters in our sample to spontaneously tell us why they refrained from using the proposed channel of e-voting in the 2007 local elections (*Figure 8*).

*Figure 8: Subjective reasons for not using e-voting among traditional voters*



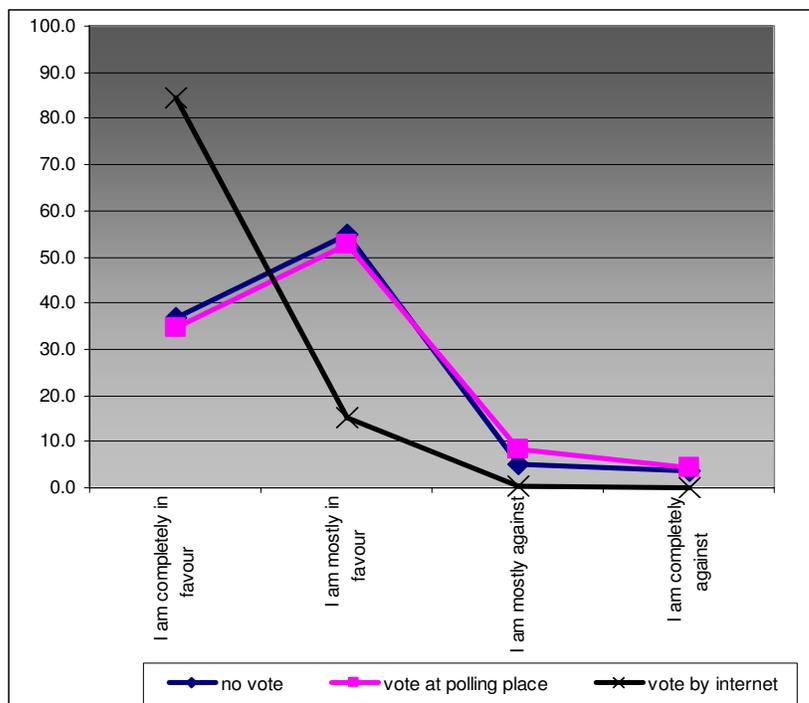
Note: N=350. Valid cases=350, missing cases=0.

*Figure 8* reveals a very clear pattern as well. The most commonly cited hurdle was the missing ID card reader (28.9 percent). In 6 percent of all cases the respondents declared not possessing an electronic ID card. However, other technological hurdles (no Internet connection, doesn't know how to vote over the Internet, considered to be too new, no computer) were given as the major reasons for not voting over the Internet by over 40 percent of the traditional voters. Finally, roughly one out of six

traditional voters indicates some sort of polling-place conservatism, either because he or she simply likes going to the polling place, because the latter is nearby or because e-voting is simply judged uninteresting.

We first asked all respondents whether they favoured or rejected voting over the Internet as an additional feature to pre-existing voting channels (*Figure 9*).

*Figure 9: Attitude towards e-voting as a supplementary means of participation*



Note: N=982. Valid cases=856, missing cases=126.

*Figure 9* contains three curves respectively representing the opinions of non-voters, voters at the polling stations and e-voters. The pattern is very clear: a rather impressive majority of Internet voters is completely in favour or e-voting (over 80 percent) with the rest being at least mostly in favour. Only one single respondent indicated being “mostly against it” and none of the e-voters was completely against it. Note that the figures for e-voters in 2005 are identical to those of 2007.

Non-voters and voters having chosen to go to the polls show an almost identical pattern with regard to the question of e-voting: about one third is completely in favour, Over 50 percent are mostly in favour, which, added up, reveals an overwhelmingly positive attitude towards this new voting mechanism. Although the pattern has remained the same since 2005, the level of this figure has gone up. One should stress at this point that among those respondents who actually experienced voting over the Internet the attitude is almost unanimous and very strong. While it is sound to assume that predispositions to e-voting were stronger from the outset among those voters having “tried it out”, it is equally sound to assume that exposure to the system did not counteract this positive predisposition. Quite to the contrary, we can assume that exposure to the system may well have intensified these predispositions, resulting in this impressive level of strong support of e-voting, something, one should rush to underline, is not necessarily self-evident.

In a further step we asked respondents whether they would use the Internet for voting in several different electoral contexts, should e-voting be provided for. The respondent could indicate more than one category of elections they could think of being candidates for e-voting, hence the number of cases in this analysis (n=1894) exceeds our overall sample size (n=982). *Table 8* shows these responses according to the mode of participation of the electorate.

*Table 8: Mode of participation and utility of e-voting in variable electoral contexts*

Mode of participation If e-voting could be used for other elections, would you use it in...	vote at the polling place			n
	no vote	e-vote	e-vote	
...local elections	19.6	16.3	19.3	316
...National elections (Riigikogu)	19.6	16.5	19.7	321
...European Parliament elections	11.5	13.0	16.8	251
...Referendum	12.4	13.5	17.0	259
...all elections and Referendums	27.3	26.1	27.0	461
...never	9.6	14.6	0.1	112
N contained in analysis	322	547	851	1720
Don't know (missing)	61	76	11	148
Overall n	352	471	840	1663

*Table 8* contains a number of intriguing results. While in 2005 about one third of non-voters and traditional voters indicated that they could imagine using e-voting in any election or referendum process, this proportion has now slightly decreased. More importantly, an impressive 80 percent of e-voters in 2005 saw e-voting as an unconditional utility in every electoral context. This is very different from 2007, where e-voters do not distinguish themselves anymore from non-voters and traditional voters in this category. Also, for more selective respondents, it is not the local level anymore which enjoys primacy over all other levels of electoral competition in which e-voting was seen as a desired device in 2005. Two years ago, within each category of voters and non-voters, if one did not necessarily favour a complete generalisation of e-voting, then it was the local level at which this device was seen most acceptable, respectively desired. The usefulness of e-voting is now affecting all forms of elections and referendums more equally. Finally, the formerly large number of non-voters and traditional voters indicating that they would “never” use e-voting (21.9 percent, respectively 35 percent) in 2005 has now drastically fallen by 50 percent. Among e-voters, in 2007, the proportion of “never again” attitudes has sunk from 0.3 to 0.1 percent.

## **7 Choosing to e-vote: explanatory models**

This part of the study presents three partial models explaining the decision to vote via the Internet instead of voting at the polling station: a socio-demographic and -economic model, a political model and an ICT model. After investigating each partial model separately, we will combine the three models into an overall, global model explaining the choice of the channel of participation.

### **7.1 Socio-demographic and –economic (SDE) model**

There has already been some discussion of socio-demographic and –economic variables and their impact on the choice of voting over the Internet, namely age, gender and the type of settlement (urban or rural). It became apparent that age had a large impact, while the impact of gender was less important and the type of settlement had no impact at all. Before turning to the discussion of our first partial model including all socio-demographic and –economic variables, we will present briefly the remaining variables belonging to this category, i.e. education, occupational status, income and language.

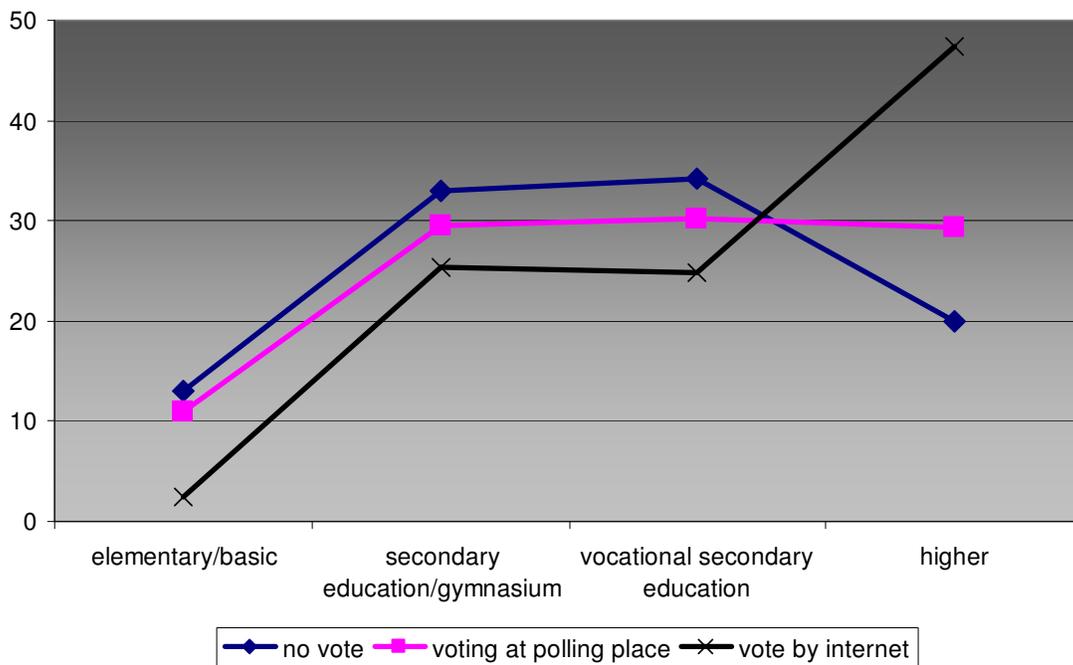
#### **7.1.1 Education**

The respondents in our survey were asked about their highest level of educational attainment. We classified all respondents according to four categories: elementary/basic education, secondary education/high school, vocational secondary education and higher education.

The comparative literature on voting behaviour finds that educational levels are typically correlated with participation at the polls: the higher the educational resources of a voter, the higher his or her probability of participating in elections. In the case of the parliamentary elections in Estonia this general trend is only weakly apparent. *Figure 10* presents the composition of the group of non-voters, e-voters and traditional voters with respect to the level of education. It shows that traditional

voters do have a slightly more important proportion of higher educated individuals compared to non-voters. Inversely, the proportion of non-voters having only a basic level of education is only marginally more important than its respective counterpart within the group of traditional voters. However, our analysis reveals a significant difference between e-voters and the rest of the electorate. Almost 50 percent of e-voters have a higher education level compared to 30 percent in the case of traditional voters and a good 20 percent in the case of non-voters. In other words, e-voting in Estonia was by no means “education-neutral” as the share of highly educated voters was by almost 20 percentage points higher among e-voters than among traditional voters.

*Figure 10: Levels of education among voters and non-voters*



### **7.1.2 Occupational status**

Another important socio-demographic and -economic factor is the occupational status of the respondents. *Table 9* shows that e-voters are above all employees in both the private and public sector. Salaried workers in the public sector are almost

twice as strongly represented among e-voters than in the electorate as a whole (and as among non-voters and traditional voters in particular). On the other hand, retired people are clearly underrepresented, which, of course, is directly linked to the age-distribution discussed earlier.

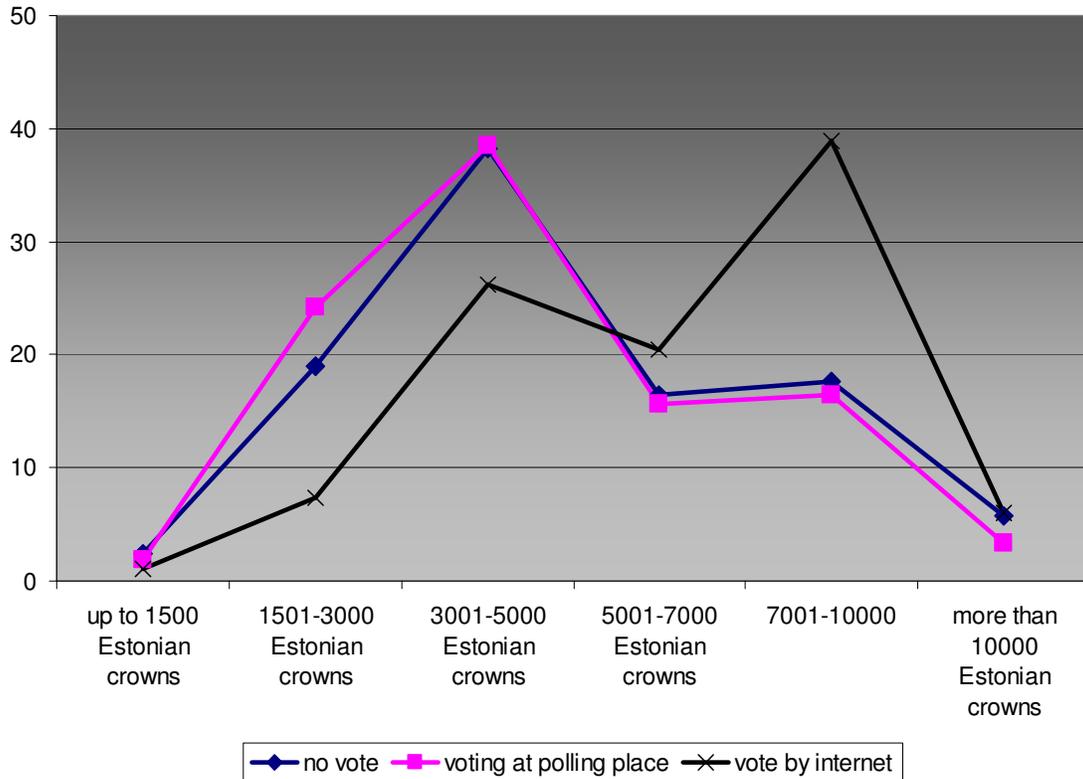
*Table 9: Occupational status and mode of participation*

Mode of participation	no vote	vote at the polling place	e-vote	n
<b>Occupational status</b>				
entrepreneur, farmer, self-employed person	12.4	6.3	10.9	93
freelancer	4.1	1.1	1.1	18
salaried worker in public sector	11.9	18.7	30.5	212
salaried worker in private sector	39.9	32.1	39.0	359
student	7.0	5.0	2.7	46
retired	16.1	31.9	9.0	190
at home	7.4	4.4	6.0	56
unemployed	0.8	0.6	0.3	5
other	0.4	0.0	0.5	3
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>982</b>

### **7.1.3 Income**

Given the overall large socio-demographic and –economic similarities between traditional voters and non-voters it is not surprising that their respective income patterns are identical, showing an inverse u-shaped curve, skewed towards the lower side of the income categories. E-voters show a similar pattern with, however, one important difference: the highest income-category is heavily overrepresented among e-voters. While individuals at this level of income (with an overall household income between 7000 and 10000 Estonian Crowns) represent 18 percent of the non-voters and 16 percent of the traditional voters, this figure more than doubles for e-voters, rising to almost 40 percent (*Figure 11*).

Figure 11: Levels of income among voters and non-voters



### 7.1.4 Language

Two major language groups dominate the ethno-linguistic structure of Estonia: Estonians and Russians. The latter group represents one quarter of the population (Table 10). Among our sample of non-voters and traditional voters we find Russian speakers slightly underrepresented with 18 percent. Non-voters contain 23 percent Russian speakers and traditional voters 15 percent, indicating a large linguistic cleavage when it comes to participation in the parliamentary election: Russian speakers in Estonia participated disproportionately less in this election. Among e-voters, they are quasi-absent: only 1.6 percent of our e-voters hail from the Russian speaking community in Estonia. This is probably related to the fact that the official language of the e-voting system was Estonian. Although some information material was given in Russian, this might have induced most Russian native speakers not to use this channel of electoral participation.

*Table 10: Ethnic nationality in 2006*

Ethnic nationality	n	percent
Estonians	921908	68.6
Russians	345168	25.7
Ukrainians	28321	2.1
Belorussians	16316	1.2
Finns	11163	0.8
Tatars	2500	0.2
Latvians	2230	0.2
Poles	2097	0.2
Jews	1939	0.1
Lithuanians	2079	0.2
Germans	1895	0.1
Other ethnic nationalities	9068	0.7
Total	1344684	100

Source: Official statistics from the Statistical Office of Estonia (<http://www.stat.ee/>)

### **7.1.5 The SDE model**

To determine the relative impact of socio-demographic and –economic factors on the choice of e-voting over traditional participation we have estimated a multivariate model including all socio-demographic and –economic variables. We applied a logistic regression approach as our dependent variable is dichotomous (0=traditional voting, 1=e-voting). The aim of this analysis is to show the relative impact of our independent variables that are either treated in an ordinal format or coded as dummies.<sup>31</sup> Therefore, we are able to include in our model the following variables: age, gender, type of settlement (urban/rural), level of education, income and language. We excluded the variable measuring the occupational status of respondents as the latter cannot be recoded as an ordinal variable.<sup>32</sup>

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<sup>31</sup> Variables that can take exactly two values are coded as dummy variables, while variables that can take more than two values are coded in a meaningful ordinal manner.

<sup>32</sup> The estimation results of the socio-demographic and –economic model remain robust when we include dummy variables for occupational status in our model.

*Table 11: Multi-variate models explaining the decision to e-vote rather than vote at the polling stations (logistic regression coefficients)*

COEFFICIENT	SDE MODEL	POLITICAL MODEL	ICT MODEL	GLOBAL MODEL
Age	-0.21*** (0.05)			0.36*** (0.11)
Gender	-0.23 (0.17)			-0.06 (0.26)
Settlement	-0.18 (0.18)			-0.01 (0.27)
Education	0.30*** (0.09)			0.03 (0.15)
Income	0.38*** (0.07)			0.12 (0.12)
Language	-2.28*** (0.42)			-2.35*** (0.65)
Left-right scale		0.17*** (0.05)		-0.06 (0.07)
Political discussions		-0.31*** (0.12)		-0.08 (0.16)
Trust in Parliament/government		-0.35 (0.26)		0.21 (0.34)
Trust in politicians		-0.26 (0.26)		-0.85** (0.34)
Trust in the State		-0.07 (0.19)		-0.10 (0.26)
Computing knowledge			-0.52*** (0.12)	-0.65*** (0.17)
Frequency of Internet use			0.15*** (0.05)	0.19*** (0.06)
Location of Internet access			-0.08 (0.08)	-0.10 (0.10)
Trust in transactions on the Internet			-0.14 (0.17)	-0.16 (0.21)
Trust in the procedure of e-voting			-1.27*** (0.19)	-1.22*** (0.25)
Constant	1.40* (0.73)	1.03 (0.64)	3.17*** (0.59)	6.34*** (1.75)
Observations	731	489	602	425
Pseudo R2 (McFadden)	0.15	0.05	0.24	0.28

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Regarding the coefficients we estimate, it must be underlined that it is not possible to identify the spread of the effect of each variable by looking at the logistic regression coefficients as the latter depend on the spread of the independent variable itself.

However, the sign of the coefficient (either positive or negative) indicates the structure of the relationship between the independent variables and the dependent variable. For example, if we find a positive coefficient for the variable “income” we can infer that the higher the income of a respondent, the higher his or her probability to vote by Internet as opposed to voting at the polling place. Also, an important factor for the interpretation of our coefficients will be their levels of statistical significance.

While our bi-variate analyses have shown several interesting relationships, it is only through the use of multi-variate models that we will be able to make statements about their respective importance, taking into account all other independent variables.

Column 1 of *Table 11* shows the non-standardised regression coefficients of the six variables included in our model. Age, level of education, income and language are highly significant predictors of e-voting, confirming the bi-variate relationships and their directions. However, gender and type of settlement have no significant effect on the choice of e-voting over voting at the polling stations. Our bi-variate analyses already showed the absence of any urban-rural cleavage. However, our bi-variate analyses showed that men were to some extent more prone to vote over the Internet than women. In the multi-variate analysis, however, this cleavage completely disappears. Clearly, other factors contribute to the explanation of why voters chose to vote over the Internet rather than voting at the polling station. We therefore continue in our investigations and subsequently estimate two alternative models to our socio-demographic and –economic model, namely a political and an ICT model.

## **7.2 Political model**

In the political model we use several relevant independent variables which we do not comment on in detail (bi-variatly) before turning to the estimation of the entire model. However, we make one exception, namely the variable measuring party choice among traditional voters and e-voters. This variable cannot be coded in an ordinal manner and we therefore refrain from including it in our multi-variate model,

but provide some descriptive evidence on its relation with the choice of the voting channel.

*Figure 12: Partisan choice and choice of voting channel*

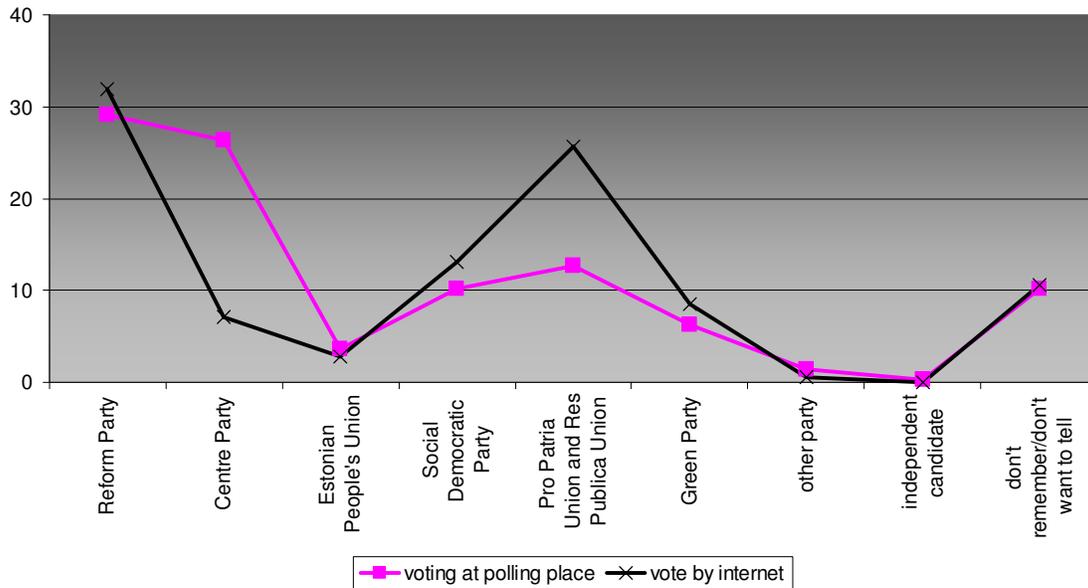


Figure 12 shows that e-voters and traditional voters do not politically behave in complete correspondence. As our data shows, e-voters do not only differ with regard to their socio-demographic and -economic profiles, but they also do so (quite unsurprisingly) with regard to their political preferences. Two parties are particularly affected by this: the Centre Party (clearly underrepresented among e-voters) and the Pro Patria Union (clearly over-represented among e-voters). However, as long as e-voting remains a marginal phenomenon (recall that overall, there were only 3.4 percent of the Estonian electorate participating to the polls) these differences do not produce any reshaping of the political landscape in partisan terms. Note that we found the same discrepancy in the study regarding the 2005 local elections.

For the estimation of our political model we have a set of variables at our disposal, which we can easily include in the model. First, we have asked voters to position themselves on the traditional left-right scale. Secondly, we tried to measure their

level of politicization by finding out how frequently they engage in political discussions with friends and family. Thirdly, we dispose of three variables measuring the Estonian voters' trust in Estonians political institutions and actors (trust in Parliament/government, trust in Estonian politicians, trust in the State).

The results in column 2 of *Table 11* show first that the left-right scale has a significant impact on the choice of e-voting. Generally, the more to the right a voter places him- or herself on this scale, the more likely his or her probability to vote over the Internet. The second significant variable is the frequency of political discussions. Whether one is politically interested and active (at least to the point of discussing politics with friends and family), or not at all does have a significant impact on the choice of the voting channel. Interestingly, the estimated coefficients of the political model reveal that being politically interested and active is associated with a lower probability of e-voting. All trust-variables, i.e. trust in Parliament and government, trust in the state and trust in politicians, are insignificant.

A word concerning the explanatory power of the political model: despite the statistical significance of three out of the five variables we included in the model, McFadden's Pseudo  $R^2$  is only .05. This is a rough indication that the overall model-fit is poor. Political variables, taken together, do therefore not seem to make a major contribution to the explanation of e-voting in Estonia.

### **7.3 ICT model**

The last partial model that we estimated contains a set of explanatory variables measuring the self-assessed computing knowledge of the respondents, their frequency of Internet use, the place they access the Internet from, their trust in interactions on the Internet (such as e-banking or buying goods over the Internet) and finally their trust in the procedure of Internet voting itself.

First, note that the ICT model appears to have a good overall fit, as measured by McFadden's Pseudo  $R^2$ , which is 0.24 (last row, 3<sup>rd</sup> column of *Table 11*). This indicates a strong relationship between the explanatory variables and the dependent variable.

Three of the five entered variables exert statistically significant effects on the dependent variable. The following conclusions can be drawn: the higher one's computing knowledge, the higher the frequency of Internet use and, above all, the larger one's trust in the procedure of e-voting itself, the higher one's probability to vote over the Internet. Interestingly enough, the variables measuring the trust in transactions on the Internet or the location from where they access the Internet do not impact on the choice to e-vote.

#### **7.4 Global model**

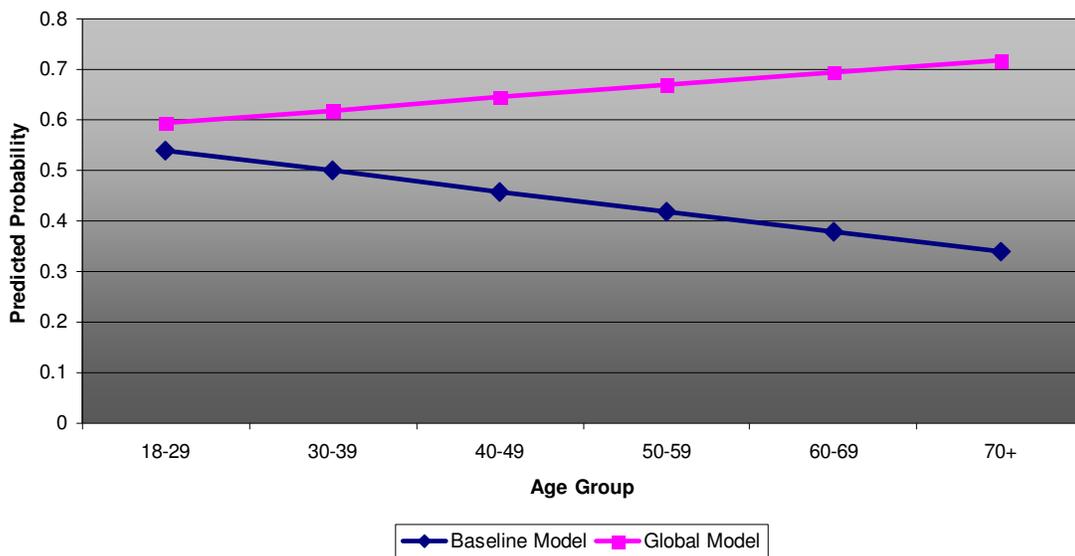
Finally, we have combined all partial models presented above into an overall model for the explanation of e-voting. Including all independent variables simultaneously in a model explaining the choice of the voting channel, delivers a number of exceptionally interesting results from which several cutting-edge conclusions can be drawn with regard to the Estonian elections over the Internet. The results of estimating the global model can be seen in the last column of *Table 11*.

First of all, the overall fit of the global model appears to be satisfactory indicated by a Pseudo  $R^2$  of 0.28. Keeping in mind the caveats of interpreting this number as a measure for the explanatory power of a certain specification, it is interesting to see that the Pseudo  $R^2$  of the global model is only slightly higher than that of the ICT model. This can be regarded as an indication that compared to the ICT model, which is nested in the overall specification, the global model adds little explanatory power.

The second striking observation is the effect of controlling for political and ICT variables on the coefficients associated with socio-demographic and economic

factors. When simultaneously estimating the effects of all our independent variables, we first find that two of our initially significant socio-demographic and economic effects totally disappear. Levels of education as well as levels of income lose their entire significance. Age and language remain strongly significant. However, note that in contrast to the partial (or baseline) socio-demographic model the age-coefficient is positive in the global model. In-depth analysis revealed that the reversed impact of age on the probability to e-vote is due to the inclusion of the ICT-variables into the model, and in particular to the inclusion of the variable “computing knowledge”. This is due to a strong negative correlation between age and the ICT variables (e.g. the correlation coefficient between the ordinal age-group variable and the variable measuring computing knowledge is .64).

*Figure 13: Predicted Probabilities by age groups with ordinal age variable*

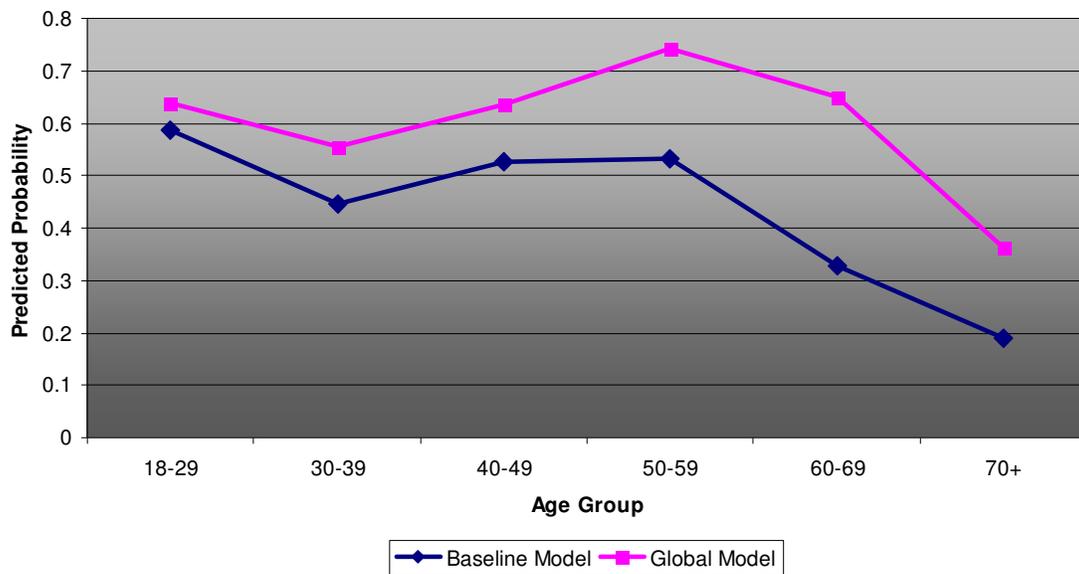


*Figure 13* presents the difference in the predicted probabilities to e-vote by age-groups between the partial (baseline) model and the global model. While in the first panel (representing the baseline model) of *Figure 13* the probability to e-vote is upward sloping, a negative trend becomes apparent in the global specification. Obviously the monotonic behaviour of the predicted probabilities is due to the ordinal nature of the age-group variable. If we instead code the age-groups as several

dummy variables and calculate predicted probabilities holding all other included variables at their sample means, the predicted probability curve becomes almost hump-shaped in both specifications as can be seen in panel A of *Figure 14*.

However, while in the baseline model the probability to e-vote peaks for the very young, the inclusion of ICT variables shifts the maximum to voters in their 50s. Looking at the overall shape of the two curves, it seems as if controlling for ICT variables has shifted the predicted probabilities up for all ages with a more pronounced upward shift for older age groups.

*Figure 14: Predicted Probabilities by age groups with dummy age variables*



How can these differences be reconciled? The interpretation of the changing age-effect is actually quite straightforward: Older individuals tend to have less ICT knowledge as opposed to younger individuals. Accounting for this difference in ICT knowledge reveals – conservatively interpreted – at least no negative impact of age on the probability to e-vote. Based on this result one might speculate that as today’s younger and ICT knowledgeable cohorts grow old, the propensity to e-vote will show no age-effect in a long-term perspective even in the unconditional case.

The significant political variables in the political model lose importance in the global model. Left-right auto-positioning and the frequency of political discussions become totally insignificant. Interestingly, the trust in politicians now appears to be of statistical importance at the 5 percent level. The negative sign indicates a positive relation between trust in politicians and the propensity to e-vote. Experimenting with different specifications has revealed that the inclusion of socio-demographic and -economic variables alone caused the change in significance levels of the mentioned political variables. Bi-variate correlation analysis showed a positive correlation between being more to the right on the left-right scale and being an Estonian native speaker. Hence, the significance of the left-right variable in the partial model might have been driven by the dominant language effect. An analogous analysis for the frequency of political discussions indicates a negative relation with age, which presumably caused the significance of the frequency of political discussions in the partial model.

Regarding our ICT variables, the global model confirms their importance. Computing knowledge, the frequency of Internet use, and, above all, trust in the procedure of Internet voting can maintain their structural impact on the dependent variable and remain strongly significant.

One could argue that “trust in the mechanism of e-voting” is somewhat tautological with e-voting. If such a criticism were valid, this could affect the impact of the other variables on our dependent variable. We therefore estimated a supplementary model in which we omitted this variable. It turned out that all our results from the global model remain valid.

### ***7.5 Change in the determinants of the choice of the voting channel: A comparison with results from the local elections in 2005***

Our empirical analysis is methodologically consistent with the one presented in Breuer and Trechsel (2006). All variables included in the partial models as well as the global model are constructed identically. Moreover, the underlying questions the

respondents had to answer were phrased in the same way. Hence, we have a repeated cross-section that allows us to compare directly the determinants of the choice of the voting channel in the 2007 parliamentary elections and the 2005 local elections.

The key conclusion to be drawn from this exercise is that our results are extremely robust. That is, the main predictors of the probability to vote via the Internet instead of voting at the polling station remained the same. Only small changes in the size of the estimated coefficients and the significance levels exist. As in 2005 the probability to e-vote instead of voting at the polling station was mainly determined by the trust in the e-voting procedure, the computing knowledge and the first language. The strong correlation between ICT variables and age was also found in Breuer and Trechsel (2006).

Only two variables appear to be significant in the global model estimated based on the 2007 data that showed no statistical importance before: the trust in the politicians and the frequency of Internet use. The latter variable just barely missed the significance at the 5 percent level in 2005 and its relation with the outcome variable is quite intuitive. The trust in politicians, however, was far from having any common significance threshold in 2005 and the interpretation of the effect is thus more challenging. While it is quite impossible with the data in hand to make statements about a causal link between the trust in politicians and the outcome variable, the difference in statistical importance between 2005 and 2007 is probably related to a compositional shift within the sample of voters. While in 2005 58 percent of all voters claimed to at least tend to trust the politicians, the corresponding figure in 2007 rose to 79 percent. One might speculate that the e-voting channel of participation in the election benefited more than voting at the polling station from this increase in the trust in politicians.

Overall, the comparison with the results from 2005 reassures us that the factors that we are highlighting in this study are indeed the most important determinants of the choice to vote via the Internet instead of voting at the polling station.

## **8 Conclusions**

This study of the first national e-elections for parliament ever held in the world is unique in that it allows us to go much further than simply commenting aggregate level results published by the authorities and taken over in newspaper articles. Our survey allowed us to accurately measure the impact of socio-demographic, -economic, political and technology-related variables on the choice of e-voting on the individual level. These, from our point of view important findings, can be summarised as follows.

First, e-voting in Estonia remains a participation channel mainly used by younger generations among the electorate. However, the lack of familiarity with Internet technologies appears to be the key-explanation for the observed age pattern. One might speculate that, as the Internet experienced cohort ages, this pattern will disappear over time. Studies show that once Internet technologies are used by people, they continue to be used by those same people. Our study confirmed this with regard to the 2005 and 2007 elections in Estonia: 100 percent of all 2005 e-voters in our sample have voted over the Internet in 2007.

Second, language remains a problem in a linguistically divided society, such as the Estonian one, unless the authorities offer the e-voting tool in a multi-lingual context. From a linguistic point of view, everything remained more or less the same as in the 2005 elections. In Estonia, the fact that the e-voting procedure in both the 2005 and 2007 elections was solely in Estonian caused a very large part of the Russian speaking community to refrain from using this tool, and this is true, we should underline, with all other factors held constant. In order to convince larger parts of the already large community of Russian speakers in Estonia to use e-voting, offering this device in Russian becomes indispensable.

Third, ICT variables such as computing knowledge and frequency of Internet use constitute a barrier for e-voting. This is identical to our findings regarding the local

elections of 2005, with the exception of Internet usage patterns which were, in 2005, not significant predictors of Internet voting. It is not so much the divide between “Internet access haves” and “Internet access have-nots”, but clearly their computing skills and Internet experience that made citizens choose either option of voting. Boosting computing knowledge and the experience with the Internet among the population may therefore clearly boost Internet voting in the future.

Fourth, independently of all other considerations, the trust of citizens in the mechanism of e-voting remains a central issue. Here again, this result confirms our study regarding the 2005 local elections. Most of the use of e-voting in fact boils down to the simple question: does one trust or not this mechanism to take one’s vote correctly into account, producing trustworthy results? If this question can be answered by an unconditional, or almost unconditional “yes”, then the probability for one’s use of e-voting at the polls goes significantly up. Any successful information policy pointing in the direction of giving voters trust in the mechanism itself will therefore make this means of participation more popular.

Fifth, some non-results are of utmost importance. For instance, we found that e-voting is completely neutral with respect to such crucial variables as gender, income, education and the type of settlement – as soon as we control for our entire set of independent variables. These results indicate that e-voting scores quite high on a scale of truly democratic procedures. This is not self-evident at all. Had we found looming discrepancies according to gender or income, for instance, one could have easily criticized the new form of voting over the Internet as introducing very undemocratic biases into the electoral process. This is clearly not the case. Again, these non-results are identical to the results from our study regarding the 2005 elections.

Sixth, it is the political neutrality of e-voting that is at stake. We found that e-voters behave differently from traditional voters with regard to party choice. Also, in our partial model, left-right aut positioning and the frequency of political discussions had significant impacts. However, these effects completely disappeared in our overall

model, suggesting that these variables are correlated with more dominant determinants of e-voting: When controlling for all our independent variables, the initial political bias disappears, but the trust in politicians suddenly plays an important role. A broad faith in the political leaders seems to foster the acceptance of new means of participation such as e-voting. Although our data prohibits a more rigorous investigation of how “party choice” affects the “voting channel choice”, the analysis of the left-right scale variable is most certainly a good proxy for a more diversified analysis. Together with the results from the local elections in 2005, this reassures us to assume that e-voting in Estonia does not produce the feared political effects that become apparent at first sight. Hence, we can conclude that in the Estonian case the introduction of e-voting can be regarded as politically rather innocent.

Seventh, from the Estonian data, we see that both voter and political parties are quickly adapting to Internet elections as well as the Internet as an information source. The political parties in Estonia are pushing information to voters on the Internet and many voters are using the Internet as a primary means of getting information about the elections. Interestingly, we also note from our analysis that some forms of Internet communication, such as videos, penetrate to the non-voting population as well, which is a positive sign that technology can reach non-voters and potentially bring them into the voting fold.

Given that the parties see the Internet as a tool for reaching out to voters and recognise that voters want easy access information online, this outreach will only increase. Websites, videos, emails, and the like all linked parties and voters in ways that had never occurred before.

Finally, when we looked at campaign information sources for voters, based on the mode of voting that they used, we found that in a number of important instances there were marked differences among voters based on the mode of voting they employed. Specifically, Internet voters were less affected by traditional modes of political communication: they were less likely to have obtained information from radio, flyers and leaflets, political ads in papers and magazines, posters in the streets, party

tents and outdoor events, or direct mail. Also, the other major difference between Internet voters and polling place voters was that Internet voters were more likely to obtain election information online and to talk about the election with co-workers and family members.

## **9 Recommendations**

On the basis of this report, we would like to propose a number of recommendations in the field of Internet voting. In the 2005 Council of Europe report we divided the recommendations into two categories: the first addressed the concrete e-voting project in Estonia, the second aimed at a larger audience willing to take Internet voting towards reaching levels of best practice. In this study we focus on the first category by discussing the recommendations contained in the 2005 report and, in view of the 2007 findings, evaluate their current relevance. The “wider recommendations”, such as the need for diffusion, the usefulness of reversible voting, the usefulness of academic follow-up analyses, the respect of the Council of Europe Recommendation on e-voting<sup>33</sup>, will not be repeated in this report – for the latter we refer the reader to the 2005 report on e-voting in the Estonian local elections.

- A) In the Council of Europe report on the 2005 local elections, the authors stressed that the success of Internet voting is clearly linked to the overall ICT awareness among the electorate as well as the overall diffusion of ICT-related practices. This statement remains entirely valid in 2007. Estonia’s efforts in this field are impressive and lead to this Internet-voting-favourable ground. We recommend that the efforts towards the strengthening of the information society in Estonia remain a priority for the government should e-voting become a permanent feature of Estonia’s political landscape. In light of our 2007 findings we maintain this recommendation in its entirety.
  
- B) Evaluating the role of the Internet in the parliamentary election campaign reveals that certain traditional campaign methods and media capture the

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<sup>33</sup> The recommendation entitled “Legal, operational and technical standards for e-voting” was adopted by the Committee of Ministers of the Council of Europe on 30 September 2004 and can be found on [http://www.coe.int/T/E/Integrated\\_Projects/democracy/02\\_Activities/02\\_e-voting/01\\_Recommendation/Rec%282004%2911\\_Eng\\_Evoting\\_and\\_Expl\\_Memo.pdf](http://www.coe.int/T/E/Integrated_Projects/democracy/02_Activities/02_e-voting/01_Recommendation/Rec%282004%2911_Eng_Evoting_and_Expl_Memo.pdf).

attention of non-voters more than do many of the online communication channels. While online e-campaigning is growing in importance, parties, candidates and media should still be encouraged to target the broadest electorate possible so that new voters can be drawn into the voting process.

- C) The Estonian e-voting system was openly presented to many experts from different nations, who desired to study the system. Such a high degree of transparency ensures a fast learning process about the features of this novel voting channel. We recommend maintaining this degree of openness and transparency in future uses of the e-voting system. In particular, close technological monitoring should become a standard feature of e-enabled elections and referendums.
  
- D) The Estonian e-voting system has so far not been subject to a comprehensive certification procedure. We recommend that a debate be initiated about possible future certification regimes. Building on the 2004 Committee of Ministers Recommendation on legal, operational and technical standards for e-voting, the Council of Europe could serve as a platform for an exchange of expertise and good practice with regard to standard-setting and certification in the field of e-voting.
  
- E) In the 2005 report the authors stressed the language problem which is specific to Estonia, but potentially important to any multilingual polity. Language is a strong predictor for the choice of voting over the Internet or to physically go to the polling place. As in 2005, the 2007 Russian-speaking voters disproportionately avoided Internet voting compared to Estonian speaking voters. In order not to become a means of exclusion and to give all potential voters the same opportunities to participate, we continue recommending that the Internet voting application and related information also proposed in Russian. Note that the 2007 e-voting system contained a “help function” which was proposed both in Russian and English. In our view,

this is a first step towards the implementation of the recommendation we formulated first in 2005.

F) In 2005 we mentioned that while e-voting is an important innovation, other e-tools have been tested, aiming at increasing citizens' interest in politics and, if so, their participation in the electoral realm. We therefore recommended the establishment of "electoral platforms" in which e-voting is an important but not exclusive element. This recommendation can be fully reiterated in 2007.

G) The Council of Europe Report on the 2005 local elections in Estonia evaluated the three-day voting period for Internet voting as insufficient. The authors postulated that an extension of this period would most certainly attract a number of future e-voters. The added value of voting over the Internet is, amongst others, due to the freedom of choice with regard to the moment of voting. With only three days, this comparative advantage over voting at the polling place might be reduced. Moreover, extending the period of e-voting to more than 3 days could also lead to an improved security. Internet attacks, such as DDoS (Distributed Denial of Service) attacks, could have hampered the ability to run the e-voting application. An extension of the e-voting period could potentially make it more difficult to launch such attacks. In 2005 the Council of Europe Report recommended to initiate a debate about the potential extension of the period during which e-votes can be cast. As the 2007 national elections did not extend the e-voting period, this recommendation remains valid.